SR1000 Requirements

1 INTRODUCTION

1.1 Purpose and Scope

The NAS System Requirements Specification (NASSRS) is a compilation of requirements which describe the operational capabilities for the National Airspace System (NAS) as the NAS is envisioned to exist by the year 2000. In that context, it includes those existing and transitional system capabilities that will also exist in the 2000 system. It is intended primarily for use as an internal FAA management tool to support the NAS design, engineering, and acquisition activities and to manage and control change to the NAS.

The document provides a ground-based systems representation of the proposed operational capabilities planned for the NAS. As programs and subsystems are developed and implemented the capabilities they provide will be compared to this document as a measure of success of NAS Plan implementation.

The NASSRS does not impose specific requirements for procedures, services, or regulation upon the users or specialists operating within the NAS; nor should any requirements stated within this document be construed as specifying services that will necessarily be provided by the FAA. This document will undergo continuing review and update to reflect current FAA planning with respect to proposed capabilities and to ensure consistency with program/system developments. Projections, estimates, and/or assumptions made herein are based on available information which may change over time, resulting in modification of the NASSRS. Similarly, changes may be required because of the unavailability of funds.

1.2 Background

The Federal Aviation Administration has established specific goals for modernization of the National Airspace System over the next decade. These include the replacement and modernization of aging air traffic control and navigation equipment and the development of a more comprehensive and coordinated system design to reflect specific needs of the user and specialist communities, to enhance safety, to improve efficiency and capacity, and to reduce operating costs. The programs to achieve these objectives are documented in the NAS Plan for Facilities, Equipment and Associated Development.

In conjunction with the NAS Plan, the FAA has prepared system engineering management documents to assist in the orderly development and integration of NAS Plan programs. The NASSRS provides a basic tool in the system engineering process and is followed by the system-level design documents.

The system-level design for the NAS is described in three basic levels of design. The NAS System Specification contains a functional and qualitative description of the basic NAS elements, subelements, subsystems and their relationships along with facility quantity, location and connectivity, data/voice communication requirements, end-to-end data flows and allocated performance requirements. The NAS Transition Plan describes the required transition steps including interface and integration test requirements. The NAS Site Designs contain detailed site-specific designs required for

program installation, training, logistics and logistics support.

The Operational Requirements for the NAS programs are provided in the NAS System Requirements Specification. Preparation of this document involved two parallel efforts. The first was a review of the current operational services provided by the NAS directly to the users. A hierarchy of these services was developed from extensive review of applicable documentation such as the Airman's Information Manual, the Air Traffic Control Handbook, and the Flight Services Handbook supplemented by knowledge about the NAS. In addition, new or enhanced services that will be provided in the future were developed from reference to the NAS Plan and its various programs. The second of the parallel efforts was review of existing system specifications, technical orders, program plans, and various other documents to identify requirements that had already been established. Many of these requirements were stated explicitly in the documents, but others were inferred from the content of the documents. These documents are listed in Appendix B (Bibliography).

These requirements were then presented to a group of experts from around the nation consisting of air traffic control, systems engineering and program specialists for validation of the requirements from the standpoint of the FAA operating specialist. Once the basic content and structure of the requirements were fixed, the necessary quantification and performance standards were added to ensure that in the following years, the various programs and products will actually satisfy the requirements and meet the goals of the system. Review and comments were additionally solicited from user groups, other FAA organizations, and the DoD, all of whom provided valuable reviews and comments on the document.

The resulting requirements are presented in this document as a management tool to facilitate implementation of the NAS Plan and to provide a forum for extensive coordination and validation of associated requirements.

1.3 Document Evolution

The NAS Systems Requirements Specification will be maintained to reflect changes as new capabilities are developed, existing systems are retired, and new needs are identified. Proposed changes to system requirements received by the FAA will be reviewed and analyzed to assess their potential costs and benefits. Based on these analyses, candidate requirements may be accepted, rejected, or returned for modification. Validated requirements which cannot be implemented for funding, technical, or other reasons are retained as unsatisfied requirements; all such requirements will be incorporated in an appendix to the requirements document. If approved for implementation, candidate requirements become unallocated requirements which will be incorporated in the requirements document and the NAS System Specification. The requirements document will be revised and reissued periodically as approved changes are adopted.

1.4 Compliance Evolution

The Federal Aviation Act of 0958.

2 OVERVIEW

The system requirements presented in Chapter 3 of this Document are organized in a top-down hierarchical structure that facilitates their orderly development to the required level of detail as shown in Figure 2-0. Each two digit section (e.g., 3.0) broadly describes the operational function performed. Listed below each of these sections are three digit

sections (e.g., 3.0.0), which contain a statement of the general requirement to be fulfilled, followed by the specific requirements of the system (e.g., 3.0.0.A). These sections provide the required capabilities that are necessary for providing services to the users of the National Airspace System (NAS).

Requirements are grouped into eight operational categories which are summarized below.

2.1 Flight Planning

Flight planning for both visual and instrument flight supports safe and efficient flight. This planning requires accurate and timely weather information, current aeronautical information, and knowledge of potential or actual airspace or route saturation. In addition, the NAS must be capable of receiving flight information from varied sources and distributing this information to the appropriate user/specialist.

2.2 Traffic Control and Airspace Management

Control and management of operations requires extensive capabilities to achieve the safe and efficient flow of air traffic throughout the NAS. To exercise control of aircraft, the system must have information about the current and expected trajectory for each aircraft operating in the system. The traffic control and airspace management requirements address the following capabilities:

o Flow control, including the allocation of available airspace capacity and determination and communication of flight restrictions to ensure that delays are minimized
o Approach and departure sequencing to determine the order of aircraft landing at, or departing from, an aerodrome
o Aircraft separation to provide clearances that maintain separation standards for specified conditions
o Control outside of independent surveillance coverage to establish separation based on user position reports and the application of expanded, improved separation standards
o Collision avoidance, including the prediction of collisions and determination of conflict avoidance maneuvers
o Ground and obstacle avoidance to provide ground-based assistance to users in maintaining safe clearance from the ground, mountainous terrain and man-made obstacles o In-flight emergency assistance, including the procedures and communications for providing emergency assistance to users
o Search and rescue capabilities to meet the federal interagency agreements for assisting aircraft experiencing in-flight emergencies o Special services for military aircraft to accommodate requests for special handling of aircraft within the NAS in accordance with established agreements
o Airport movement area control to require that aids be provided to both the user and the specialists to ensure safe operations on airport movement areas

2.3 Monitoring

The monitoring requirements provide for various flight services to support operations within the NAS. These capabilities include provisions for flight following to monitor flight progress when requested and to issue traffic and weather advisories.

2.4 Navigation

Navigation requirements address the capabilities to provide en route and terminal navigation aids to assist the pilot of an aircraft in determining his position in the airspace at any given time and, additionally, to provide assistance in locating terminal facilities.

Terminal approach and landing requirements describe aids which assist the pilot in the identification of an aerodrome and active landing area and provide guidance to aircraft under primarily instrument meteorological conditions. Visual approach and landing aids will assist in the identification of aerodromes and active landing areas under reduced visibility and visual meteorological conditions.

2.5 Air Defense and Law Enforcement Surveillance

These requirements are concerned with the detection, identification, location and control of aircraft in the Air Defense Identification Zone (ADIZ) and in the Distant Early Warning Identification Zone (DEWIZ) in the vicinity of U.S. and international airspace boundaries.

Additional provisions are included for communications and coordination among FAA and military specialists and law enforcement officials for operations that involve defense of U.S. airspace.

The surveillance requirements specifically address determination of position, velocity and altitude of known, participating and nonparticipating aircraft in the ADIZ/DEWIZ and identification of unauthorized intruder aircraft.

2.6 Communications

NAS communications requirements encompass extensive capabilities for providing voice and data communications throughout the NAS and with external facilities and government agencies. These requirements address the air-ground, ground-ground interfacility and ground-ground intrafacility voice and data communications between aircraft and air traffic control and flight service facilities, between FAA and external facilities, and within NAS facilities.

2.7 Maintenance and Support

Maintenance and monitoring requirements entail the overall provision of equipment and facilities to support the NAS. Support will also be provided to accomplish the necessary training, testing, and frequency management to ensure that the services provided meet the goals of the system.

2.8 System Effectiveness

Effectiveness requirements describe the tolerances associated with the loss of service and prioritize each of the NAS functional categories with respect to the safe operation and control of the system.

3 SYSTEM REQUIREMENTS

The mission of the FAA includes the central objective of providing for the safe and efficient use of the nation's airspace, while minimizing constraints on its use. The NAS requires direct services to meet the needs of all users, in order to support aircraft operations under varying conditions of weather, demand on the system, and emergency situations. Flight planning, aircraft separation, air defense, law enforcement, control, and monitoring capabilities are required along with surveillance, navigation, and communication capabilities supporting the oceanic, remote, en route, terminal, and

aerodrome operations. Additionally, maintenance support and system effectiveness requirements are imposed.

3.1 Flight Planning

Safe and efficient use of the nation's airspace requires the provision of flight planning capabilities. Flight planning requires information such as expected route, altitude, and time of flight, as well as the anticipated flight conditions including weather, navigation systems, available routes, special use airspace, and flow control conditions. An overview of the organization of the requirements for flight planning is illustrated in Figure 3-0.

3.1.1 Weather Information (Strategic)

3.1.1.1 General Requirements

Weather conditions can significantly affect aircraft operations, performance and safety. Planning of flights requires the availability of timely and accurate weather information such as: upper air winds, upper air temperatures, and hazardous weather data. A capability is required to select and access weather information which could affect flight planning. Weather information is required by specialists and users. The organization of the requirements for this section is illustrated in Figure 3-3.

3.1.1.2 Specific Requirements

The NAS shall acquire and maintain weather information covering the area of NAS responsibility for both domestic and foreign operations. Weather information shall include current, trend, and forecast weather and shall include surface and atmospheric weather at all altitudes affecting flight planning, efficiency, and safety.

The NAS shall acquire and maintain current, trend, and forecast weather information for all areas of the U.S. (including Alaska and Hawaii), Canada, Mexico, the Caribbean and the Gulf of Mexico including specified oceanic areas from FAA, NWS, DoD, and private sources of weather data as required and available.

The NAS shall acquire and maintain current surface aviation weather observations.

The content of surface observations shall include at least the following elements:M

(1) Cloud layer height and amount
(2) Visibility
(3) Precipitation occurrence, type and amount
(4) Temperature
(5) Dew point
(6) Wind speed, direction, and peak gusts
(7) Altimeter setting and density altitude
(8) Obstruction to visibility
(9) Lightning or thunderstorms
(10) Runway visual range
(11) Snow depth and runway surface condition

At selected aerodromes the NAS shall provide an automated means for measuring and reporting selected elements of surface weather. The NAS shall also provide for entry of surface observation weather information by qualified specialists.

The automated weather observation capability shall report weather information once per minute to selected interfaces and to a national data base for distribution once per hour and as required by significant changes.

Special surface weather observations shall be taken and reported as needed.

Runway visibility measurement capability shall additionally be provided for designated runways at selected U.S. aerodromes with precision approach procedures.

The NAS shall provide the capability to acquire weather conditions aloft information for all U.S. airspace.

The content of weather aloft information shall include at least the following:

(1) Wind speed and direction aloft
(2) Temperature aloft
(3) Tops and bottoms of cloud layers
(4) Clear air turbulence
(5) Thunderstorms with associated turbulence and hail
(6) Icing

Coverage resolution and retention of weather aloft information shall be as follows:

(1) From 6000 feet above the ground to 60,000 feet MSL in the area of NAS responsibility
(2) From ground level to 10,000 feet AGL within 45 nmi of qualifying aerodromes (stated in MSL)
(3) Information shall be updated locally every 5 minutes to the then current information
(4) Information shall be reported to a national data base at least every 60 minutes
(5) Weather conditions aloft, except for thunderstorms, shall be retained on a 50 nmi by 50 nmi grid
(6) Thunderstorm data shall be retained on a 10 nmi by 10 nmi grid in three altitude bands

The NAS shall provide the capability to acquire, receive and maintain Pilot

Reports (PIREPS) about weather information aloft.

The NAS shall provide the capability to receive PIREPs utilizing voice or data from users and external sources (e.g., airline dispatch office) via common carrier network and for airborne filing via voice or data communications.

The NAS shall provide processing for PIREPs and efficient assimilation of PIREPs into appropriate databases (e.g, screening and purging).

The NAS shall acquire and maintain trend weather information for both surface observations and weather conditions aloft for the past 3 hours. Trend weather shall also include:

a. Forecast values from unexpired terminal forecasts
b. Position, altitude, and intensity data and forecast data from any unexpired forecasts about thunderstorms
c. All pilot reported data

The NAS shall acquire and maintain forecast weather information. Forecast weather shall include Terminal Forecasts (for qualifying terminals), Area Forecasts, Winds Aloft Forecasts, and unscheduled short-term advisories and forecasts.

Terminal Forecasts shall be updated at least every 6 hours and shall cover a forecast period from 0 to 24 hours.

Area Forecasts shall be updated at least every 12 hours and shall cover a forecast period from 0 to 24 hours.

Winds and temperatures aloft forecasts shall be updated at least every 12 hours and shall cover a forecast period from 0 to 30 hours.

The NAS shall provide short term (up to 2 hours) and near term (4 to 12 hours) forecasts specific to ACF area of responsibility.

The NAS shall predict the movement of storm cells for periods of 10, 20 and 30 minutes into the future. These predictions shall be updated every 5 minutes.

Information concerning weather conditions that are potentially hazardous to aviation shall be given priority as to acquisition and dissemination. Hazardous weather shall include the following weather conditions:

1. Turbulence
2. Icing
3. Thunderstorms
4. Wind shear
5. Microbursts
6. Sustained surface winds

7. Low visibility
8. Heavy precipitation, lightning, or hail

The NAS shall be capable of providing pictorial displays of real-time weather data (e.g., radar) to users and specialists.

The specialist (i.e., meteorologist) shall be provided graphic information and shall be capable of viewing animation and overlay of graphic products including:

a. Mosaiced weather radar data
b. Satellite data
c. NWS graphics
d. Local station model plots
e. Upper air data

Pictorial real-time weather information provided and displayed to specialists shall include:

a. Weather radar
b. Satellite
c. NWS graphics
d. Specialist annotations

Real-time weather information shall be provided to users in a format suitable for pictorial display on user supplied compatible devices on the ground and in the cockpit.

Weather information shall be processed and presented in such a way as to support its interpretation by users and specialists.

Pictorial displays shall allow different elements of the display to be separately distinguishable (e.g., by utilizing levels of brightness or colors).

Weather information shall be supplied in a consistent format for an area of interest (e.g., wind speed, temperature, precipitation, and cloud cover) and shall be available throughout any area of interest.

Weather information shall include both horizontal and vertical depictions of weather conditions.

Flexible and convenient access to required weather information by users and specialists is required.

The NAS shall allow user access via voice to specialist in person, via telephone, and VHF or UHF radio.

The NAS shall provide commercially available (e.g., RS-232, RS-449, telephone, UHF, VHF or equivalent) interfaces and support to provide for users' access via voice and data communications to weather information.

The NAS shall provide user-friendly interactive on-line support to both users and specialists including such features as function keys, input menus, and prompting.

Weather retrieval capabilities shall allow the selection of weather for a specified route, area, or location and shall include weather for all phases of flight.

The NAS shall provide route-oriented retrievals along a corridor up to 200 miles wide along a specified route. Weather information shall be included for those reporting stations within the specified retrieval corridor.

The NAS shall provide area related weather information for predefined or user/specialist defined areas and altitudes of interest. Areas shall be defined by a location and a radius of up to 100 miles or by other predefined identifiers.

The NAS shall provide weather information by reporting station and weather type as specified by a user/ specialist.

Weather information retrievals shall allow filtering of weather information appropriate to the departure, destination, and en route portions of the flight by criteria to include weather type, altitude of flight, content of the weather information, duration of flight, and time of flight.

Hazardous weather information shall be provided with sufficient accuracy and emphasis in sufficient time to permit users to avoid the hazard and/or permit specialists to assist users in avoiding the hazard.

The NAS shall alert users and/or specialists to the presence of hazardous weather.

Hazardous and routine weather information shall be presented to the specialist within 3.0 seconds of a request (mean response time).

Hazardous weather information shall be available to specialists and users within 2 minutes of identification of the hazardous weather phenomenon, and shall be maintained current locally to within 2 minutes. Hazardous weather information shall be maintained current nationally to within 30 minutes or less as conditions warrant thereafter, until the hazard has dissipated.

Terminal area hazardous weather information shall be available to specialists and users within one minute of detection and shall be current to within one minute thereafter, until the hazard has moved out of the terminal area or dissipated.

When hazardous weather information is received by NAS, the specialist shall be alerted by an audible and/or visual alarm.

NAS capacity to acquire, process, and disseminate weather information must be sufficient to meet required response times during peak demand. Communication links must be adequate to avoid user/specialist delay in gaining access.

Specialist access to weather information shall be provided with a mean response time of 3.0 seconds from the time a request for information is made.

User access shall be provided to weather information via commercially available communication links (e.g., commercial telephone and dedicated or dial-up ports).

Once a user has gained access to the NAS, weather information shall be provided with a mean response time of 3.0 seconds from the time a request for information is made.

The NAS is required to meet the expected demand for weather requests (e.g., pilot briefings) during times of peak demand.

Weather information shall be continuously (24 hours a day) accessible to users with or without the aid of a specialist.

3.1.2 Aeronautical Information (Strategic)

3.1.2.1 General Requirements

Aeronautical information (e.g., information regarding special use airspace, preferred or fuel-efficient routes, traffic management, or the condition of selected NAS components) is required in support of flight planning. Such information is required to be easily and conveniently available to users for the total geographic area of NAS responsibility. Because of the large volume of aeronautical information, there is a requirement to tailor the information presented to only that which is important to a specified route and time of flight or to specified locations or areas. Such information is required by users during all phases of flight.

3.1.2.2 Specific Requirements

Aeronautical information shall be acquired by the NAS.

This information shall include at a minimum the following, for the entire geographic area of NAS responsibility:

a. Information concerning the establishment, condition, or change in any component of the NAS, the timely knowledge of which is essential to personnel concerned with flight operations
b. Information regarding the boundaries and times of restriction for special use airspace
c. Information regarding preferred, fuel-efficient, and/or low altitude routes
d. Traffic management information
e. Information regarding alternate routing to be used to avoid conditions which preclude original route availability

The NAS shall be capable of accepting, and in selected cases verifying, aeronautical information from any source, including users, military and other governmental organizations, and private organizations concerned with operations or components of the NAS.

Information regarding preferred routes shall be available at least 24 hours in advance of the time it becomes effective. Information regarding special use airspace shall be available at least 2 hours in advance of the time it becomes effective. Other aeronautical information shall be available for dissemination no later than one minute after entry into any NAS data base.

Aeronautical information which becomes no longer valid/relevant shall be deleted from the base of available information within one hour.

Aeronautical information shall be continuously (24 hours a day) accessible to specialists.

Aeronautical information shall be continuously (24 hours a day) accessible to users upon request with or without the aid of specialists

Aeronautical information shall be obtainable along a specified route, or in conjunction with specified locations or areas, or by reporting location.

The selection of aeronautical information shall accommodate routes of arbitrary length, with up to 40 route elements.

As many as 8 specified locations or a single area shall be accommodated per request.

Information from as many as 8 reporting locations shall be selectable per request.

Communication capabilities must be adequate to avoid user delay in gaining access and to avoid delay in dissemination of aeronautical information.

Users shall be able to access aeronautical information over common carrier telecommunications lines or via air-ground data communications.

Access over common carrier telecommunications lines shall be in accordance with requirement 3.6.2.B.7.

The NAS capacity to provide aeronautical information must be sufficient to meet required response times during peak demand.

The time from initiation of a request for aeronautical information by a specialist and receipt of the requested information shall not exceed 10 seconds.

The time from initiation of a request for aeronautical information by a user

and receipt of the requested information shall not exceed 10 seconds.

3.1.3 Flow Control and Delay Advisories

3.1.3.1 General Requirements

Saturation of specific airspace or aerodromes may require that aircraft be delayed or diverted in order to maintain safety. Knowledge of actual or potential saturation during flight planning allows plans to be adjusted for maximum efficiency. Therefore, the flow control and delay advisory information that affects flight planning must be disseminated.

3.1.3.2 Specific Requirements

Flight information, airway/route usage, flight data summarized as to time and location, and real-time flight data (e.g., cancellations, diversions and delays) shall be available to users and specialists.

The NAS shall provide available flight information to specialists at the Air Traffic Control Command Center (ATCCC) where central traffic flow management is performed.

Local traffic management coordinators at ARTCCs, selected terminals and future ACFs shall be provided with flight data and flow management information pertaining to their assigned airspace structure boundary. Additionally, local traffic coordination specialists shall be provided NAS central flow information summaries, which include the following:

A. Current flow restrictions in effect throughout the NAS
B. Traffic loading information summarized by fix, sector, airway/route, or boundary crossing points and by time (e.g., 15 minute intervals)

The NAS shall provide users with flight information pertaining to flow management, including current weather and forecasts, and current and future delay advisories in effect along the user's proposed flight path.

Current and forecast weather data, both foreign and domestic, shall be available for flow control use.

Current and forecast weather data shall be available within 10 seconds of a specialist's request.

Weather forecasts shall be provided up to 24 hours in advance.

Weather data (both forecast and current) shall be available for the entire NAS geographic coverage area and oceanic area. Foreign weather shall also be available, including terminal forecasts at major international aerodromes.

The NAS shall provide the capability for the local traffic management coordinators to receive unscheduled weather forecasts that generally describe conditions expected to begin 4 to 12 hours after issuance.

Processing and communications capacity shall be provided to accommodate the demand for the dissemination of flow control and delay advisory information.

Users shall receive requested flow control and delay advisory information within 6 seconds of a request. ATCCC specialists and local traffic management coordinators shall receive requested information within 10 seconds of a request.

Users shall receive flow control information, including delays, routing changes, and other movement data on specific flights, from the NAS over standard commercially available voice and data channels. ATCCC specialists and local traffic management coordinators shall receive flow control information continuously via NAS communications capabilities.

The NAS shall provide for checking of all metering generated recommendations for flight plan based trajectories, aircraft conflicts, and aircraft to airspace conflicts.

3.1.4 Flight Plan Submission and Evaluation

3.1.4.1 General Requirements

The NAS shall process foreign and domestic flight plan information and exchange it with users and specialists.

3.1.4.2 Specific requirements

The NAS shall provide a capability to receive proposed flight plans and amendments to proposed flight plans from users and specialists.

The NAS shall be capable of receiving proposed flight plans and amendments to proposed flight plans in the following ways: user direct at NAS facilities via NAS input/output devices, user direct via user input/output devices, and via specialist inputs at NAS facilities.

The system shall be capable of validating and processing flight plans submitted in either a domestic or an international flight plan format.

The system shall be capable of accepting both VFR and IFR flight plans.

The system shall be capable of accepting multiple flight plans and stopovers (a flight plan with more than one leg filed) from users.

The system should be capable of accepting flight plans up to 24 hours in advance, subject to storage limitations.

The system shall be capable of accepting and storing recurring (e.g., canned, stereo) flight plans from those users (e.g., military, airlines) who have requested and received NAS approval for filing of recurring flight plans.

The NAS shall provide for direct user input/output of flight plan information over easily used input/output devices readily available to users.

The NAS shall be capable of receiving proposed flight plans and amendments to proposed flight plans via direct inputs from commercially available input devices, over commercially available communications systems.

The NAS shall be capable of providing prompts and formatting information to allow users to file flight plans directly from input/output devices, such as portable computers or terminals.

The NAS shall provide a method to utilize commonly used flight plan information (e.g. preferred routes and standard aircraft profiles) without re-entering such information for every flight plan.

The system shall interactively support NAS and user preferred routes between departure and destination points.

The NAS shall be capable of accepting flight plans defining user preferred speed and altitude profiles in detail.

The system shall be capable of duplicating repetitive information (aircraft equipment code, color, and speed) when a user is submitting multiple flight plans.

The NAS shall provide a capability for direct interaction with users/specialists in the process of flight plan validation and acceptance. The NAS shall inform users/ specialists of errors it detects and allow correction of such errors.

The system shall be capable of evaluating a proposed flight plan or amendment prior to acceptance. The evaluation process shall include identification of the user, identification of the aircraft, logic check of the data submitted, and verification of the flight plan for aircraft to airspace conflicts and predicted noncompliances with flow restrictions.

The system shall provide the user/specialist with the reason(s) for rejection of a flight plan. The user/specialist shall have the option of correcting only the system-identified error(s) without having to re-input the entire flight plan.

The NAS shall inform users/specialists when a flight plan or amendment has been accepted.

The NAS shall provide a capability for specialists to amend active flight plans.

The system shall provide safeguards to ensure that active flight plans may be amended only by authorized specialists.

The system shall provide safeguards to ensure that flight plans may be opened or activated only by authorized specialists.

Amendments to active flight plans, once accepted, shall be immediately incorporated into the flight plan so that any specialist viewing that flight plan

will see only the most current information.

The NAS shall ensure that once a flight plan has been displayed to a specialist, any amendment made to that flight plan between the time the flight plan has been passed and the time that specialist accepts the handoff shall be easily discernible from the original message (e.g., different color, italics, and parentheses).

The NAS shall retain the original flight plan request [exclusive of preferred departure routings (PDRs), preferred arrival routings (PARs), and other ATC requirements], for possible retrieval by a specialist in the departure ACF.

The NAS shall disseminate flight plan information to all NAS and foreign facilities that provide control/support to the proposed plan of flight.

The NAS shall be capable of automatic addressing and dissemination of flight plan information processed by the system to affected NAS, military, and adjacent foreign air traffic control facilities.

The NAS shall be capable of automated exchange of flight plan information and traffic handoffs with appropriately equipped adjacent foreign facilities.

The system shall store prefiled flight plans and process them in correct time sequence, prior to the time the flight becomes active.

The NAS shall be capable of passing flight plan information to adjacent foreign facilities within the time frames specified by international and bilateral agreements.

The NAS shall be capable of reformatting international flight plan information, if required by adjacent foreign facilities, to either ICAO or other agreed upon formats for the exchange of flight plan information.

Direct interfaces are required between NAS automation systems and user automation systems for the exchange of flight plan information.

The NAS shall be capable of exchanging flight plan information with user automation systems through interfaces with common carrier communications networks.

The NAS shall be capable of being accessed through user supplied, commercially available communications interfaces.

The NAS shall be capable of supporting user supplied, dedicated, sole use interfaces with selected user automation systems (e.g., airline and military)

The system shall provide appropriate safeguards to protect flight plans from unauthorized modifications.

The NAS shall be capable of exchanging flight plan information with users via air-ground voice or air-ground data communications systems.

NAS capacity must be sufficient to meet required response time during peak demand. Communication links must be adequate to avoid user delay in gaining access.

The NAS-provided interfaces shall have sufficient capacity for users to be able to gain direct access within 5 seconds after the connection has been made.

The NAS shall be capable of validating and processing proposed flight plans and amendments to proposed flight plans and responding to the user/specialist within 10 seconds (99th percentile) of the input.

The NAS shall be capable of validating and processing active flight plans and amendments to active flight plans within 10 seconds (99th percentile) for probe and route amendments and within 10 seconds (99th percentile) for all other actions.

The NAS capacity to process flight plan information must be sufficient to meet required response times during peak demand.

The NAS shall provide a capability for specialists and users to cancel or close flight plans which have been entered into the system. Acceptance shall be via commercially available communications systems or through specialist inputs at NAS facilities.

3.2 Traffic Control and Airspace Management

The NAS has responsibility to assist the safe and efficient flow of traffic from departure aerodrome (or entrance to the system) to destination aerodrome (or exit from the system). It provides flight control services in the en route, terminal, and oceanic airspace. It also provides search and rescue services to locate lost aircraft. In order to exercise control of aircraft, the NAS must have information about the expected routes, times, altitudes of flight, and aircraft characteristics. It must also have information about current location, altitude, and track for each participating aircraft in the system. An overview of the organization of the requirements for traffic control and airspace management is illustrated in Figure 3-4.

3.2.1 Airspace Management

3.2.1.1 General Requirements

Maximum safety and efficiency in the use of airspace or aerodromes results from a flow of air traffic which matches airspace user demands with available capacity, reducing congestion and unnecessary delays, allowing delays to be taken on the ground whenever possible, and accommodating military operations and national defense requirements. Maintaining this type of traffic flow imposes a requirement for a traffic management function which collects data on current and predicted airspace capacity and demand and compares these to detect potential and actual airspace saturation.

3.2.1.2 Specific Requirements

The NAS shall be capable of projecting the current and future capacity of, and demand on, specified sectors and airway route segments using available data.

IFR traffic capacity projections shall be available to ATCCC specialists and local traffic management coordinators for specified sectors, airway route segments, and aerodromes. The NAS shall monitor and use information pertinent to capacity projections such as sector area current weather and forecast weather, navigation equipment operational status, aerodrome operational status, runway configuration, and aircraft performance characteristics.

IFR traffic demand projections shall be available to ATCCC specialists on any specified sector or airway route segment. The NAS shall monitor and use information pertinent to demand projections such as stored flight plan information, filed flight plan information, aerodrome operational status, historic demand profiles, scheduled special events, and military operations.

Sector and airway route segment capacity and demand projections shall be provided to ATCCC specialists for up to 8 hours beyond the current time and to local traffic management coordinators for up to 2 hours beyond the current time.

Capacity and demand projections shall be performed on request and the results shall be available to the ATCCC specialists and to the local traffic management coordinators within 10 seconds of a request.

The NAS shall be capable of projecting for specified aerodromes and runways the numbers of arrivals and departures that can be handled and the number of planned arrivals and departures.

The number of arrivals and departures of IFR traffic that can be handled by a specific aerodrome shall be provided by the NAS. Factors such as runway surface conditions, surface weather, winds aloft, local acceptance rate data, and terminal navigation equipment status shall be monitored and used to determine actual capacity projections.

Aerodrome capacity projections shall be displayed by number of aircraft per minute, or time interval specified, and categorized by aircraft performance type.

Aerodrome capacity projections shall be provided to ATCCC specialists up to 8 hours in advance and to local traffic coordinators up to 2 hours in advance, updated when conditions change.

The number of planned arrivals and departures of IFR traffic projected in the future at a specific aerodrome or runway shall be provided by the NAS. Factors such as runway surface conditions, surface weather, winds aloft, and terminal navigation equipment status shall be monitored and used to determine actual capacity projections.

Aerodrome future demand projections shall be provided for up to 8 hours in advance.

Demand projections shall be displayed to the specialist by number of aircraft per time interval specified by the specialist and other selected

criteria.

The NAS shall be capable of exchanging airport utilization data and scheduled airline data, in both voice and data formats, with appropriately equipped airline dispatch offices.

The NAS shall have the capability to determine, for each participating aircraft in controlled airspace, the current location, altitude, speed, and track. This information shall be available to the appropriate specialists.

Information about each aircraft's position, altitude, speed, and track shall be provided to the local traffic management coordinators. Information accuracy shall be within the following limits:

Horizontal position information provided to local traffic management coordinators shall be accurate (99th percentile) to within 2.04 nmi for target ranges greater than 100 nmi and to within 1.0 nmi for target ranges less than or equal to 100 nmi.

The aircraft's reported altitude shall be provided to the local flow management coordinator.

The displayed track for straight line flight shall not differ from the true track by more than 5 degrees.

The displayed ground speed shall be accurate to within 20 nmi of the true ground speed for a constant, straight-line flight.

This information shall be available to local traffic management coordinators performing a flow control function for any IFR aircraft in the conterminous United States, Alaska and Hawaii on request and shall be available within 00 seconds of a specialist's request.

The NAS shall have the capability to predict, for each participating aircraft in controlled airspace, estimates of future location, altitude, speed, and track. This information shall be available to the appropriate specialists.

Short-term predictions (i.e., up to two hours) shall use current surveillance information, such as actual aircraft position, speed, and track in conjunction with associated flight plan information.

Short-term prediction accuracy shall be based on the following minimum criteria:

a. Metering delay estimation shall be accurate to within 1 minute.
b. The metering advisory accuracy shall provide less than 10 percent difference between the amount of delay time which a speed or descent advisory is calculated to absorb and the actual delay absorbed.
c. Altitude information provided to the local flow management coordinator shall be accurate to within 1000 feet for predicted altitude profiles derived from aircraft specific data.

Predictions shall be available for the entire flight of aircraft (i.e., long-term predictions), based on flight plan information.

Predictions shall be available within 10 seconds of an ATCCC specialist or local traffic management coordinator request for this service.

Current and forecast weather data, both foreign and domestic, shall be available for flow control use. Such data shall include hazardous terminal and en route weather, local terminal forecasts, and winds aloft.

Current and forecast weather data shall be available within 10 seconds of an ATCCC specialist or local traffic management coordinator request.

Weather forecasts shall cover a forecast period of 0 to 24 hours.

Weather data (both forecast and current) shall be available for the entire NAS geographic coverage area and oceanic area. Foreign weather shall also be available, including major international aerodromes.

ATCCC specialists shall be provided with graphical presentations of the weather anywhere in the NAS coverage area along with ATC facility boundary data as needed. Forecast information for up to 24 hours in advance shall be available in graphic form. Textual weather and forecast information shall be available for foreign weather and NAS terminal weather.

ACF specialists shall be provided with complete weather information for their assigned airspace. This includes graphical representation of terminal area weather and sector forecast weather for up to 24 hours in advance updated every 4 hours. Textual information shall be provided for adjacent airspace forecast and current weather.

The NAS shall provide the capability of receiving and storing satellite-generated environmental data at the ATCCC and accepting updates as frequently as every 30 minutes.

The NAS shall provide the capability to produce and store a national weather radar mosaic for flow control use at the ATCCC. This product shall be generated every 10 minutes or upon request.

The NAS shall provide the capability to display at the ATCCC weather products from individual ACFs.

The NAS shall have the capability to determine actual or potential saturation of any selected airspace and/or aerodromes specified by the specialist. Information shall be generated that will summarize the problems with regard to saturated airspace.

Potential saturation of airspace or aerodromes shall be predicted at least 8 hours in advance.

The NAS shall generate and provide both local traffic management coordinators and ATCCC specialists with traffic count summary information for each sector in the NAS including total number of aircraft, aircraft IDs, and aircraft types.

The NAS shall provide the specialist with automatic displays of sector workload information (e.g., traffic count, flight plan complexity, conflicts, and traffic density) for various look-ahead times.

The NAS shall provide the specialist with continuous detection of noncompliance and advisories for resolution of noncompliance with current clearance-based trajectories within predetermined time limits for the following:

a. Metering and flow restrictions
b. Preferential route restrictions
c. Airspace restrictions

The NAS shall provide the specialist with a capability to evaluate alternate clearances beyond predetermined time limits for noncompliance with the following:

a. Metering and flow restriction
b. Airspace restrictions
c. Preferential route restrictions

Any problems identified in an alternate clearance shall be displayed to the requesting specialist.

This information shall be made available to military officials on a routine and/or as required basis.

If airspace or aerodromes are or will be saturated, the traffic management function shall have the capability to allocate available airspace or aerodrome capacity, determine flight restrictions for specific aircraft, and communicate these restrictions and alternate courses of action to users and specialists.

The NAS shall provide a capability for both ATCCC specialists and local traffic management coordinators to generate alternate trial rerouting of proposed aircraft flight plans to resolve or minimize saturation conditions.

The NAS shall provide the capability to transfer both voice and data flow control information between local traffic management coordinators at ARTCCs, selected towers or future ACFs, controllers at aerodromes, flight service stations, and the ATCCC specialists.

Local traffic management coordinators shall have voice and data connectivity to the ATCCC specialists, all towers and all flight service stations in their airspace coverage area, and all controllers in their resident facility.

ATCCC specialists shall be provided voice and data connectivity with each local traffic management coordinator. Dial-up access to all NAS towers and all flight service stations shall also be provided.

ATCCC data connectivity shall be provided to selected air traffic control towers and to all flight service stations.

Connectivity shall be provided between the traffic management function and appropriate military aircraft scheduling activities.

The NAS shall provide a capability to meter traffic to achieve a balance between traffic demand and capacity of the NAS airspace and aerodrome resources.

The NAS shall provide the capability for a central altitude reservation function that supports flow planning and conflict-free scheduling for the mass movement of aircraft, including military missions.

The NAS shall provide a capability to process, store, and display altitude reservations which define detailed flight plans and associated airspace requested by the airspace users.

The NAS shall provide a capability for trial entry of a requested or pending altitude reservation to determine potential conflicts with other approved altitude reservations.

The NAS shall provide the capability to coordinate the requested altitude reservations with local traffic management coordinators in the facilities affected by the altitude reservation and with appropriate international organizations.

Airspace users who require the altitude reservation service shall be provided voice and data connectivity with specialists at the ATCCC.

The NAS shall provide a capability for ATCCC specialists to generate plans and specify flow restrictions to alleviate traffic flow problems on an interfacility basis.

The NAS shall provide a capability for local traffic management coordinators to generate plans and specify local flow restrictions and some interfacility restrictions to alleviate traffic flow problems within their local airspace boundaries.

The NAS shall provide a capability to evaluate the effectiveness of flow restrictions implemented in the NAS. Effectiveness criteria shall include overall system performance measures.

3.2.2 Approach and Departure Sequencing

3.2.2.1 General Requirements

To make the most efficient use of airspace, specialists must provide instructions to users which will result in the establishment of landing and

departure sequences at specific aerodromes. This sequencing imposes a requirement on the NAS to provide accurate location information.

3.2.2.2 Specific Requirements

The NAS shall provide aircraft identification, location, altitude, course, speed, and characteristics for controlled aircraft within assigned airspace.

The NAS shall provide specialists with a unique aircraft identification for each controlled aircraft in the assigned airspace surrounding major aerodromes (i.e., approach control, departure queue, local terminal control, and ground control).

The NAS shall provide to specialists the position of controlled aircraft accurate to within 0.54 nmi (99th percentile) of an aircraft's actual position over the ground to a maximum range of 50 nmi from the aerodrome.

The NAS shall provide specialists with reported altitude information.

The NAS shall provide specialists with course information accurate to within 5 degrees (99th percentile) of a controlled aircraft's actual track.

The NAS shall provide specialists with speed information accurate to within 10 knots (peak RMS value) of the aircraft's ground speed during straight-line-with constant-speed flight within terminal areas. During acceleration in straight-line flight, speed will be reported to within 30 knots (peak RMS value) of true speed.

The NAS shall provide specialists with aircraft performance envelopes, including optimal descent and ascent profiles, maximum turning capability, minimum certified IFR airspeed, and acceleration/deceleration constraints.

The NAS shall receive and transmit position information via two-way communications with controlled aircraft within assigned airspace. Air-ground voice and data communications shall be provided from ground level to a minimum of 3000 feet AGL for a distance of 5 statute miles around towers at terminal facilities in the conterminous United States, Alaska, Hawaii, and Puerto Rico.

The NAS shall receive specialists' inputs, display position data received from all sources, process this information, apply procedural standards, and issue sequencing and spacing advisories to specialists.

The NAS shall receive specialists' inputs on aerodrome acceptance rates. Using the flight plan information and available surveillance data, the NAS shall apply standards for separation assurance and generate traffic sequencing and spacing advisories for orderly traffic flow making the maximum use of available aerodrome and airspace capacity. The NAS shall provide checking of all sequencing and spacing advisories for clearance-based trajectories, for aircraft-aircraft conflicts, and aircraft intrusion into special use airspace. When airspace or flow restrictions change, the NAS shall detect changes and notify appropriate specialists controlling the affected flights.

The NAS shall adjust the air traffic sequence based on inputs from specialists specifying desired sequence and time at meter fixes for selected aircraft.

The NAS shall respond to specialists' sequencing and spacing inputs in no more than 3.0 seconds maximum and update this information base within 12.0 seconds of receiving new flight information. Responses to input of surveillance information updates shall be within 2 seconds.

The NAS shall provide a capability to evaluate alternate clearances for sequencing and spacing problems within predetermined time limits. Problems and their resolutions identified in the alternate clearance shall be displayed to the requesting specialist as AERA Alert and Resolution messages.

The NAS shall be able to receive and process all departure requests and display them to the appropriate specialists.

The NAS shall receive, process, and evaluate departure requests from specialists, users filing pre-flight requests using existing ground communications systems, and aircraft-based communications systems.

The NAS shall accept, validate, and display departure requests to the appropriate specialists. This information shall be available to specialists within a locally adaptable time prior to departure.

The NAS shall provide departure request information that as a minimum includes the following items:

a. Proposed departure and destination locations and times
b. Aircraft identification and type
c. Assigned altitude
d. Assigned departure sequence and schedule, at select locations

The NAS shall provide predeparture AERA alerts regarding airspace and flow restrictions, and as a minimum include the following information:

a. Expected times and locations of airspace conflicts
b. Expected activations and deactivations of protected airspaces and flow restrictions

The NAS shall compare the actual flight paths of controlled aircraft with the paths assigned by specialists and notify the specialists of any significant deviations.

The NAS shall compare the actual flight paths of all controlled aircraft in assigned airspace to the flight path assigned to the aircraft by specialists at least once every 13 seconds.

The NAS shall provide aid to the specialists in adjusting the clearance-based trajectory when the track position along the flight path exceeds the following conformance bounds from the nominal position:

a. Longitudinal track exceeding 2 minutes or 5 nautical miles per flight hour
b. Lateral deviations from track exceeding 4 nautical miles

The NAS shall notify specialists when an aircraft has deviated from its assigned position in lateral or vertical direction. The allowable variation from assigned lateral position is locally adaptable. Known altitude deviations of +300 feet shall be annunciated. Notification will include a summary of the deviation in three-dimensional form for each aircraft identified.

The NAS shall analyze available information influencing traffic patterns and active runway selection, including current local traffic flow, local inbound traffic flow, flow metering, flight plan information, precipitation, winds aloft, local wind, barometric pressure, and runway surface conditions. Based upon this information, recommendations for current runway selection will be provided.

The NAS shall provide recommendations for future runway selection based on forecast weather and traffic conditions.

The NAS shall receive and analyze available information influencing selection of future traffic patterns and active runways, including predicted and current traffic conditions, current and forecast weather, and flow metering information.

The NAS shall perform runway selection processing for future runway configuration every 2 hours and immediately upon any wind change of more than +2.5 knots in speed or 45 degrees in direction.

The NAS shall provide candidate runway configurations for selected airports/groups of airports based on environmental, demand, and airport status data for selected look-ahead times from 0-24 hours in 15 minute intervals.

3.2.3 Aircraft Separation

3.2.3.1 General Requirements

In order to maintain a safe airspace environment, the NAS is required to maintain separation appropriate to the flight conditions and types of aircraft in the system. The NAS is required to have information about all controlled aircraft in controlled airspace. The NAS shall notify the specialist when it detects a potential or actual reduction in aircraft separation to less than the required minimum. The NAS shall notify specialists and users when a deviation from an approved clearance is detected. The NAS is required to determine recommended maneuvers that avoid or remedy such situations.

3.2.3.2 Specific Requirements

The NAS shall acquire actual flight information such as identification, current and projected location (position), altitude, speed, and track for each controlled aircraft in controlled airspace or expected to enter controlled airspace (e.g., terminal, en route, and oceanic).

The NAS shall detect each controlled aircraft in NAS controlled airspace within the following limits:

The NAS shall detect and display aircraft position to within 2.04 nmi (99th percentile) of the actual position over the ground for en route aircraft.

The NAS shall detect and display aircraft position to within 0.28 nmi (99th percentile) of actual position over the ground for aircraft in terminal areas.

The NAS shall detect and display the speed of each controlled aircraft in controlled airspace to within 20 knots (peak RMS value) of the aircraft's speed over the ground during straight-line-and-level flight at constant speed. During aircraft acceleration in level flight, speed shall be detected and displayed to within 60 knots (peak RMSvalue) of true speed.

The NAS shall detect and display the speed of controlled aircraft in terminal areas during straight-line-with-constant-speed flight to within 10 knots (peak RMS value) of true speed. During acceleration in straight-line flight, speed will be reported to within 30 knots (peak RMS value) of true speed.

The NAS shall provide the reported altitude for each controlled aircraft inside controlled airspace to within 103 feet (68th percentile).

The NAS shall detect and display aircraft track to within 5 degrees (99th percentile) of actual course.

The NAS shall project flight paths for all controlled aircraft in controlled airspace or expected to enter controlled airspace for not less than 20 minutes in advance.

The NAS shall update the actual flight position of each aircraft with a maximum time between updates of 13 seconds.

The NAS shall acquire actual flight information for each controlled aircraft in controlled airspace or inbound towards controlled airspace within a locally adaptable time or distance from the NAS boundary.

The NAS shall acquire flight plan information for each controlled aircraft in controlled airspace or about to enter controlled airspace including changes of route, altitude, and speed.

The NAS shall acquire validated flight plans and amendments from NAS facilities including Flight Service Stations, Air Route Traffic Control Centers or Area Control Facilities, Air Traffic Control Towers, Military Base

Operations, and users.

The NAS shall acquire flight plan information on all IFR aircraft under NAS control in controlled airspace or within a locally adaptable time or distance from the NAS boundary.

The NAS shall update flight plan information whenever any changes occur. Separation assurance processing shall be accomplished in no more than a maximum of 6.0 seconds after validation of an entered amendment.

The NAS shall provide clearance-based trajectories that are not constrained by physical ATC facility boundaries.

The NAS shall provide clearance-based trajectories for all portions of valid flight plans.

The NAS shall support the specialist in constructing and maintaining a detailed four-dimensional trajectory corresponding to the entire flight plan, as originally filed or amended.

The NAS shall aid the specialist in processing alternate clearances by providing the following capabilities:

a. Identification of alternate clearances
b. Revision to previous clearance-based trajectories
c. Direct routing to specified navigation points
d. Planning of alternate clearances based upon resolution of possible noncompliance to aircraft and airspace separation standards
e. Evaluation of alternate clearances for suitability and compliance to aircraft and airspace separation standards

The NAS shall associate actual flight information to flight plan information for each controlled aircraft in controlled airspace.

The NAS shall project flight paths for each controlled aircraft in controlled airspace by associating the following flight plan information with actual flight information:

a. Aircraft identification
b. Route of flight
c. Destination
d. Estimated time of arrival
e. Velocity
f. Altitude
g. Weather conditions

The NAS shall provide association of four-dimensional trajectories for all portions of each controlled aircraft's flight plan as originally filed or amended.

The NAS shall aid the specialist in adjustment of the clearance-based trajectory when the track position along the flight path exceeds preset conformance bounds of the projected position.

The NAS shall aid the specialist in determining the course required to realign a controlled aircraft with its authorized route after a deviation from it has occurred.

The NAS shall provide reminders to the specialist for each designated maneuver point in the current clearance-based trajectory.

The NAS shall alert the specialist when a controlled aircraft's track position is outside of the preset conformance bounds of its clearance-based trajectory in the lateral or vertical direction.

The NAS shall provide accurate weather information such as real-time winds and temperatures aloft to support flight path prediction.

The NAS shall provide forecast weather for trajectory development within 30 seconds of weather-product delivery to the NAS.

The NAS shall provide both current and forecast weather information in a compatible form to the systems performing the projection function.

The NAS shall display graphic weather data to the specialists with at least 6 levels of precipitation intensity. These levels shall be independently selectable by the controller.

The NAS shall provide detection of any aircraft throughout an Air Defense Identification Zone (ADIZ), Distant Early Warning Identification Zone (DEWIZ), and conterminous United States airspace.

The NAS shall acquire and display surveillance information with accuracies sufficient to allow the separation of aircraft conducting approaches to parallel runways under the following conditions:

1. When runway centerlines are at least 2500 feet apart with successive aircraft 2 nmi apart on adjacent terminal precision approach landing systems
2. When runway centerlines are at least 4300 feet apart with simultaneous approaches made by aircraft on adjacent terminal precision approach landing systems

The NAS shall provide independent surveillance coverage to the ground at all qualifying aerodromes and to specified minimum altitudes in all other areas.

The NAS shall provide independent surveillance of en route aircraft through a means which does not require cooperating equipment on the aircraft. Such surveillance shall generally be provided over the continental United

States from 6000 feet MSL to FL 200 over nonmountainous terrain and from 6000 feet MSL or the MEA, whichever is higher, to FL 200 in mountainous terrain.

The NAS shall provide independent surveillance coverage of aircraft in terminal areas through a means which does not require cooperating equipment aboard the aircraft. Such surveillance shall be provided in selected areas to the ground and in transitional airspace as required.

The NAS shall detect and process independent cooperative surveillance information for properly equipped en routeaircraft. Such surveillance shall generally be provided over the continental United States from 6000 feet MSL to FL 600 over nonmountainous terrain and from 6000 feet MSL or the MEA, whichever is higher, to FL 600 in mountainous terrain.

The NAS shall detect and process independent cooperative surveillance information for properly equipped aircraft. Such surveillance shall be provided in selected terminal areas to the ground and in transitional airspace as required.

The NAS terminal area surveillance response time, antenna boresight to display, which includes radar surveillance and data, shall be within 2.2 seconds. The NAS en route area surveillance response time, antenna boresight to display, which includes radar surveillance and data, shall be within 3.0 seconds.

The NAS shall update the actual flight position of each aircraft with a maximum time between updates of 13 seconds.

Exceptions to these requirements are permitted over areas where extraordinary measures would be required to provide coverage. In these areas, coverage shall be provided based upon consideration of the cost of providing surveillance and of air traffic in the area.

The NAS shall display controlled aircraft position and related data such as aircraft identification, assigned altitude, conformances to assigned altitude, and the source of displayed altitude data.

The NAS shall be capable of displaying the following information to controlling specialists for each aircraft under control:

a. Aircraft identification
b. Aircraft position
c. Actual or reported altitude, assigned altitude, and source of altitude information
d. Aircraft velocity
e. Aircraft type
f. Altitude conformance
g. Handoff status
h. Track status
i. Ground speed
j. Beacon code
k. Computer identification number

l. Conflict resolution advisory
m. Heavy jet indicator
n. Remarks
o. Alert special aircraft status
p. Conflict alert
q. Minimum safe altitude warning
r. Conflict probe violation
s. Failure of attempted data transmission indication

The NAS shall provide the specialist with the capability to selectively inhibit display information and/or to reposition display information.

The NAS shall display to the specialist flight plan information for any aircraft under control of the sector or about to enter the sector.

The NAS shall make available to the specialist flight plan data, sector posting data, and sector data relative to the aircraft under control. This includes but is not limited to:

a. Aircraft Identification
b. Aircraft type
c. Beacon code
d. Aircraft velocity
e. Departure point
f. Destination
g. Altitude
h. Route of flights
i. Times relative to the movement of the flight
j. Holding information
k. Approach information
m. Fixes
n. Handoff indicator
o. Vector information
p. Scratch pad
q. Remarks

The NAS shall have the capacity to display flight plan information for a minimum of 50 aircraft per sector except in oceanic sectors where the capacity shall be a minimum of 100 aircraft per sector.

The NAS shall record and independently maintain a history of all data processed or displayed to the specialists.

The NAS displays shall be capable of discriminating between designated functional category levels of weather intensity, controller alerts, flight plan amendments, emergencies, altitude assignments, and track control.

The NAS shall display to the specialist the following critical information:

a. Time
b. Altimeter setting
c. Range marks
d. Tabular lists
e. Duty runway
f. Beacon codes being monitored
g. Beacon codes available
h. Emergency information
i. Cursor/selection device positioning

The NAS shall display any problems and their resolutions identified in alternate clearances to the requesting specialist as AERA Alert and Resolution messages.

The NAS shall display appropriate geographic information and/or airspace structure information.

The NAS shall display current information on ground, terrain, obstacles, and special use airspace throughout the NAS coverage area.

Ground and terrain information shall include elevation and landmark information throughout the NAS airspace.

Obstacle information shall include obstacles which constitute a hazard to aviation or affect a minimum IFR vectoring altitude.

The NAS shall provide a flexible (variable scale, sector integrated) capability for accepting and displaying map outline data overlaid on surveillance information. This will allow both airspace structure and geographic landmark information to be used by the specialist.

The NAS shall provide the specialist with the capability to filter position display data to present only the information desired.

The NAS shall provide the capability to display outlines of runway, taxiway, and landing areas.

The NAS shall display aircraft position and related data in relation to the displayed geographical/airspace structure information. The accuracy of displayed geographical/airspace structure information shall be .26 nmi relative to actual position (99th percentile).

The NAS shall generate clearances, deliver clearances, monitor the adherence of aircraft to their clearances, and notify the specialist and/or the users whenever an aircraft deviates from its clearance by a prescribed amount.

The NAS shall provide clearances to users which ensure appropriate separation for the type of aircraft and specific route flown.

The NAS shall provide detection of aircraft-aircraft conflicts, aircraft

intrusion into special use airspace, and aircraft failure to maintain minimum safe altitude above the ground.

The NAS shall assign clearances taking into account current preferential route restrictions, metering and flow restrictions, weather obstacles, and NAS airspace restrictions.

The NAS shall deliver clearances to users allowing sufficient time to ensure that adequate separation is maintained.

The NAS shall be capable of delivering clearances via voice or data link communications to aircraft.

The NAS shall alert the specialist when a tracked aircraft's position is outside the preset conformance bounds of its clearance-based trajectory in lateral or vertical direction.

The NAS shall notify users of nonadherence to an ATC clearance within 10 seconds of the deviation.

The NAS shall detect actual and potential reduction in aircraft separation distance to less than the required minimum.

The NAS shall update and project each aircraft's flight path at least every 13 seconds.

The NAS shall compare flight path projections of each aircraft for at least 20 minutes in advance of potential conflicts.

The NAS shall detect potential noncompliance with aircraft separation requirements and alert the specialist 80 seconds prior to the occurrence of en route and 30 seconds prior to the occurrence of terminal area noncompliance.

The NAS shall provide alert symbols that differentiate between actual and potential aircraft noncompliance with separation standards.

The NAS shall provide continuous detection of aircraft-aircraft conflicts (within predetermined time limits) for current clearance-based trajectories. The NAS shall provide alerts and resolution advisories to the specialist pertaining to the detected conflicts.

The NAS shall provide a means to inhibit alerts signaling noncompliance to aircraft separation standards for military aircraft during Military Accepts Responsibility for Separation of Aircraft (MARSA) conditions and while flying in Altitude Reservation (ALTRV) formations.

The NAS shall provide continuous aircraft collision risk assessment for all tracked aircraft pairs irrespective of airspace structure boundaries, such as sector boundaries and terminal airspace boundaries. The time until noncompliance with separation standards shall be provided.

The NAS shall generate resolution advisories which consider the type of noncompliance, the performance characteristics of the aircraft involved, and the potential effects of advisories on other aircraft in the system.

The NAS shall effect coordination between all concerned specialists upon detection of actual or potential noncompliance with separation standards. The NAS shall notify any involved specialist of a separation-standard noncompliance situation which is predicted to occur.

The NAS shall provide the capability to transfer control responsibilities for a controlled aircraft from one jurisdiction to the next.

The NAS shall provide the specialist with capabilities to handoff control of aircraft across sector boundaries with no loss of separation services.

The NAS shall provide the capability to alert a receiving specialist that a tracked aircraft is within a system-adapted time or distance from the specialist's airspace and when an aircraft's route of flight will enter the receiving specialist's airspace.

The NAS shall transfer track control upon acknowledgment by the receiving controller of automatic handoff.

The NAS shall be capable of providing aircraft separation services continuously.

3.2.4 Control When Outside of Independent Surveillance Coverage

3.2.4.1 General Requirements

Aircraft operating outside of independent surveillance coverage (including independent cooperative surveillance) must rely heavily on procedural methods to determine and report aircraft position data to ATC facilities. Generally, these position reports are derived from navigational aids or from the aircraft's internal navigation system. The NAS is required to assist users in accurately determining their position and transmitting this information, either by voice or data link, to specialists. The NAS shall receive, process, and display this information and assist control specialists in providing safe and timely instructions to users to avoid noncompliance with separation standards.

3.2.4.2 Specific Requirements

The NAS shall be capable of managing traffic outside of independent (including independent cooperative) surveillance coverage when this traffic is using supplemental navigation systems.

The NAS shall, on a real-time basis, receive, process, and display data derived from an aircraft's internal navigation systems.

The NAS shall be able to accept information about aircraft operating outside of independent surveillance coverage. It shall be capable of receiving data from specialists' data entry equipment, satellites, and user supported activities at various rates. Sources included are ARINC, AFTN, data links, and airborne navigation equipment.

The NAS shall be capable of receiving, processing, and displaying flight information from aircraft outside of independent surveillance coverage which includes:

a. Call sign/identification
b. Aircraft type
c. Position
d. Speed
e. Clearance limit
f. Estimates of time of arrival at reporting fixes
g. Altitude
h. remarks

The system shall process position and identification information received from aircraft navigation systems and display that information within 15 seconds of receipt. This capability shall be provided in all oceanic areas served by the NAS, in offshore areas along shorelines, and in remote land areas where independent surveillance is not available (e.g., Alaska). Information shall be presented on situation displays.

The NAS shall be able to estimate the current position of and store flight plan information for aircraft operating outside of independent surveillance coverage. The estimated current position of an aircraft shall be updated within an adaptable time of 1 to 10 minutes.

The NAS shall provide the following functions:

a. Automated Problem Detection
b. Automated Problem Resolution with automatic display of the highest ranked resolution to the controller
c. Trial Plan Processing
d. Automated Coordination and Automated Replan
e. Conformance Monitoring and Automated Reconformance

The NAS shall have the capacity to display information for 100 aircraft per oceanic sector and 50 aircraft per non-oceanic sector in areas outside of independent surveillance coverage.

3.2.5 Collision Avoidance

3.2.5.1 General Requirements

The first priority of air traffic control is to maintain safety in flight by separating aircraft.* The capability is required to provide assistance in predicting and avoiding imminent collisions or near-collisions. The NAS shall predict potential collisions in sufficient time to allow avoidance actions to be taken without causing further conflict. * This does not include independent airborne systems, such as Traffic Alert and Collision Avoidance System (TCAS).

3.2.5.2 Specific Requirements

The NAS shall project the flight paths of known traffic within or entering

controlled airspace and determine imminent collision threats between controlled aircraft and any other known aircraft.

The flight path projection shall be based on current position, course, speed, altitude, vertical velocity, and vertical and horizontal acceleration, including turn rate.

The NAS shall generate a conflict alert if the flight path projections of a controlled aircraft and any other known aircraft indicate that the aircraft will at any point have less than minimum separation standards for the operational environment.

The NAS shall alert the specialist prior to a loss of separation minima.

The warning time (i.e., time to go to loss of separation minima, measured at time of first alert) in terminal airspace, but outside immediate aerodrome areas, shall be at least 30 seconds.

The warning time for conflicts occurring in en route airspace, but outside of immediate aerodrome areas,shall be at least 80 seconds.

System accuracy shall be such that nuisance alerts (an alert that would not be declared if the sensor system provided perfect information and if a perfect tracker were in place, but which is nevertheless declared using the data provided) shall be no more than 6 percent of all alerts declared for any realistic traffic mix. The goal for nuisance alerts shall be to reduce the ratio of nuisance alerts to total conflict alerts to 2 percent for these traffic mixes.

The NAS shall project aircraft positions by look-ahead times that are sufficient to allow avoidance actions to be taken without causing further conflicts.

The flight path projection shall be of sufficient lead time to allow collision prediction, maneuver determination, ranking of alternatives, specialist analysis, communications with the affected flight(s), flight crew reaction, and aircraft maneuvering.

If aircraft routing is available, the collision avoidance look-ahead function shall consider the entire flight path for 20 minutes into the future.

The collision avoidance look-ahead function shall consider a trajectory-based flight path for a maximum of two minutes into the future, if aircraft routing is not available, depending on the operational environment.

The flight path projections shall be updated at least once per scan of the surveillance equipment.

The NAS shall be capable of alerting both the responsible specialists and users (using any combination of audio and visual signals) immediately following the prediction of a potential collision.

The NAS shall alert the specialist to an imminent collision by aural and/or visual signals that are distinct from any other signals presented to the

specialist.

The specialist shall be notified of an NAS predicted imminent collision within 1.2 seconds (99th percentile) after the prediction is made.

The NAS notification message to the specialist shall include, as a minimum, the call sign of each positively identified aircraft predicted to collide.

The NAS shall be capable of alerting appropriately equipped users to the collision danger within 10 seconds after the prediction is made.

The NAS notification message to appropriately equipped users shall include as a minimum the relative position of the primary threat(s) and the maneuver recommended.

The NAS shall be capable of determining aircraft maneuvers to avoid a predicted potential collision, eliminating those options which create a new conflict situation.

The NAS shall, upon prediction of a collision, evaluate possible climb, descent, turn, and speed control maneuvers by one or all aircraft involved.

The collision avoidance function shall consider the aircraft's performance capabilities, current maneuver status (e.g., climbing, turning, and descending) and imminence of collision.

The evaluation of aircraft maneuvers shall consider not only the immediate threat, but the potential for conflict with other aircraft resulting from the execution of each maneuver considered. Resolution advisories shall be such that no conflicts are induced in less than 2 minutes after execution of there solution vector.

The NAS shall rank order possible maneuver(s) for each positively identified aircraft involved in the predicted collision.

The NAS shall display the recommended maneuvers to the specialists.

Recommended avoidance maneuvers shall be displayed to the specialist within 1.2 seconds (99th percentile) after the prediction of a collision.

The NAS shall display to the specialist at least one set of recommended maneuvers for each aircraft involved in the predicted collision.

The NAS shall make the collision avoidance capability available on a continuous basis.

3.2.6 Weather Avoidance

3.2.6.1 General Requirements

Hazardous weather is a significant threat to safety of flight for all aircraft, particularly in the very critical take-off and landing phases of flight. The degree of hazard posed by the weather depends upon its intensity, the characteristics

of the aircraft, and the phase of flight (take-off, en route, landing). The NAS is required to provide assistance to users in avoiding hazardous weather.

3.2.6.2 Specific Requirements

Surveillance data: requirements A, B, C, and J of 3.2.3 also apply to this paragraph. (Section 3.2.3 identifies surveillance information requirements. This section will generally not repeat these requirements but will reference 3.2.3.)

Weather Data: requirements A, B, C, D, F and G of 3.1.1 also apply to this paragraph. (Section 3.1.1 identifies weather information requirements. It specifies the requirements for weather information acquisition and maintenance, coverage, accuracy, timeliness, and content. This section will generally not repeat these requirements but will reference 3.1.1 except where there are unique or additional weather information requirements not already covered in 3.1.1.)

Hazardous weather information shall be provided with sufficient accuracy and emphasis and in sufficient time to permit users to avoid the hazard and/or permit specialists to assist users in avoiding the hazard.

The NAS shall alert users and/or specialists to the presence of hazardous weather.

The information provided shall include as appropriate to the particular weather conditions, the following:

a. Location and extent of the weather phenomena
b. Intensity - at least 2 levels
c. Wind velocity
d. Rate of precipitation
e. Direction of movement.

Minimal levels of accuracy required shall be as in 3.1.1.

The NAS shall be capable of providing hazardous weather information to users while airborne, for the volume of airspace extending from the surface to an altitude of 60,000 feet MSL and within 100 nmi horizontal distance from the aircraft's current position.

The NAS shall be capable of providing hazardous weather information to specialists for any airspace within 100 nmi of the service area of the facility at which the specialist is on duty within 3 seconds (99th percentile) of a request.

The NAS shall be capable of providing to a specialist, upon request, a summary of hazardous weather information for any airspace within the continental United States. The mean response time shall not exceed 3 seconds.

The NAS shall have the capability to provide hazardous weather information

in both graphical and text formats. The graphics format shall allow representation of at least three levels of intensity.

The NAS shall be capable of providing an aural alert when there is a significant change in the content of the hazardous weather message.

Hazardous weather information shall be available to specialists and users within 2 minutes of identification of the hazardous weather phenomenon and shall be maintained current locally to within 2 minutes.

Terminal area hazardous weather information shall be available to specialists and users within one minute of detection and shall be current to within one minute thereafter, until the hazard has moved out of the terminal area or dissipated.

The NAS shall be able to detect the level of weather intensity in order for users to decide if any avoidance actions are necessary.

Observed weather conditions shall be categorized into levels of intensity as defined in 3.1.1.A.2.

The NAS shall be capable of determining or measuring weather intensity with sufficient accuracy to assign the appropriate intensity level, while meeting the accuracy requirements of 3.1.1.A.2 above.

The NAS shall be capable of recommending aircraft actions to avoid hazardous weather.

Recommended actions shall include new routes, changes in altitude, vectors around weather, and course deviations.

In making recommendations the NAS shall give consideration to hazardous weather intensity, extent, and direction of movement; the type of aircraft, the amount of fuel remaining in the aircraft (on request by user/specialist); alternate aerodromes and routes available; and air traffic.

Recommendations shall be available to users/specialists within 1 minute of a request for service or implementation of a weather avoidance plan.

Recommendations shall be made available to the pilot of the aircraft over voice or data communications equipment.

The NAS shall be capable of assisting specialists in determining the impact of the avoidance actions and modifying the avoidance actions if required to maintain safe separation in the affected sectors.

The weather avoidance function shall be available on a continuous basis.

The NAS shall be capable of reporting the presence of wind shear within terminal areas.

The NAS shall be capable of continuously displaying surface wind speed, wind direction, and gust information within terminal areas.

Wind information shall be displayed within the air traffic control tower operational area.

Information displayed shall include wind speed, wind direction, and variations in surface winds among selected points on the aerodrome surface. Displayed information shall be accurate to the tolerances in 3.1.1.A.2.a(9) (wind speed and direction).

Information displayed shall be current in real-time.

3.2.7 Ground and Obstacle Avoidance

3.2.7.1 General Requirement

Safe operation requires that aircraft maintain specific distances from the ground, mountainous terrain, and man-made obstacles (such as buildings, antenna towers, and overhead lines). Although maintaining appropriate clearance is ultimately the responsibility of the user, the NAS is required to provide assistance.

3.2.7.2 Specific Requirements

Specific requirements A, B, C, and J of 3.2.3 also apply to this paragraph.

The NAS shall develop and maintain accurate, complete, and current information on the ground, terrain, and known obstacles, throughout the area of NAS responsibility.

Ground and terrain information developed and maintained shall include elevation data accurate to within 50 feet at each point of a grid of sufficient detail that each location in the continental U.S. is within 1.0 nmi of a grid point.

The location and elevation of all man-made obstacles whose maximum height above the surrounding terrain exceeds 200 feet shall be maintained. The location of the obstacle on the earth's surface shall be determined and maintained to an accuracy of within one arc second. This information shall be updated as required to remain current.

The NAS shall make available to users/specialists accurate, complete, and current information on the ground, terrain, and known obstacles.

Information shall be provided upon request to users and specialists at the levels of accuracy, completeness, and currency specified in (B) above.

The user/specialist shall be able to obtain information for specific geographic areas or routes of flight.

Information shall be available to specialists in a visual format which includes minimum altitudes to clear obstructions.

The NAS shall predict potential encounters of an aircraft with the ground, terrain, or obstacles in sufficient time to avoid the encounter.

Potential encounters with ground, terrain, or obstacles shall be predicted sufficiently far in advance to meet the warning time requirements of (E.1) below.

Prediction of potential encounters shall be made from both:

a. Current clearance based trajectories
b. Short-term projections based on: current position, course, speed, altitude, vertical velocity, and vertical and horizontal acceleration

The NAS shall provide a capability to evaluate alternate clearance-based trajectories with respect to potential encounters with the ground, terrain, or obstacles.

The user and specialist shall be alerted to a potential encounter of participating aircraft with the ground, terrain, or obstacles.

The appropriate specialist shall be alerted at least 40 seconds in advance of the predicted time of encounter for terminal airspace, 75 seconds for en route airspace.

The alert shall include both aural and visual alarms and identification of the aircraft involved. An indication shall be given that the message is either priority (action necessary) or advisory (information only).

The user shall be alerted at least 30 seconds in advance of the predicted time of encounter for terminal airspace, 65 seconds for en route airspace via voice and/or air-ground data communications.

The NAS shall determine aircraft actions to avoid a predicted potential encounter with the ground, terrain, or obstacles. The local terrain, nearby obstacles, weather conditions, and the presence of other aircraft in the vicinity shall be considered in determining appropriate actions to avoid an encounter.

The NAS shall display a recommended action, or a set of alternative actions, to the specialist in sufficient time to avoid the encounter. The recommended actions shall be displayed to the specialist within 5 seconds following the prediction of an encounter.

The ground avoidance, terrain avoidance, and obstacle avoidance capabilities shall be available on a continuous basis.

3.2.8 In-Flight Emergency Assistance

3.2.8.1 General Requirement

There are emergency conditions that range from concern about safety to imminent threat to life. These impose a requirement to provide a wide spectrum of assistance to resolve or reduce the criticality of the situation. The NAS is

required to respond to requests for assistance from in-flight users.

3.2.8.2 Specific Requirements

The NAS shall continuously monitor and respond to emergency transmissions received via such communication methods as radio, radar beacon, and data link.

The system shall simultaneously monitor commercially available, air-ground communications systems utilizing designated frequencies to detect emergency transmissions from users.

Any FAA facility receiving an emergency transmission from a user shall be capable of establishing radio contact with the user and of providing recommended courses of action to the user.

All received or transmitted emergency communications shall be recorded.

The capability shall be provided to minimize the need to change channels or frequencies when communicating with a user that has declared an emergency.

The capability shall be provided to notify other ATC facilities and specialists (FAA and DoD) and foreign, federal, state, and local government and private agencies of the existence of an emergency and to transfer essential information to them.

Essential information shall include, but not be limited to, the type of emergency, aircraft identification, last recorded or last known position, weather conditions at last recorded or last known position, type of aircraft, aircraft range, and number of persons on board.

The NAS shall evaluate alternative courses of action and provide recommendations to expeditiously resolve the emergency situation. This shall include, but not be limited to, conflict-free flight path generation recommendations, aerodrome recommendations, and other methods of providing assistance.

The system shall provide the specialist with the following recommendations for resolving an emergency:

a. The names, distances, and times to the nearest aerodromes
b. The heading and recommended control instructions for descent to the aerodrome selected by the user
c. Identification and location with respect to the aircraft in distress of other aircraft in conflict with the recommended emergency flight path
d. Recommended control instructions for each aircraft in conflict with the emergency flight path that can clear the flight path and still avoid other conflict

Recommendations provided by the system shall be based on the following

information provided by the specialist or retrieved from the system data base:

a. Type of emergency
b. Aircraft identification
c. Current position
d. Current altitude
e. Current airspeed
f. Current heading
g. Fuel remaining

The NAS shall provide a means for specialists to alert other specialists when an airborne communications failure is determined to have occurred.

The system shall alert ATC specialists at all ACFs along the proposed route of flight and at the proposed destination that an air-ground communications failure has apparently occurred aboard the aircraft.

The alert shall be provided by data message to all locations specified in C.1 upon release by an ATC specialist or supervisor.

The NAS shall provide alternative means of communicating with users who have lost normal communication with specialists. Alternative forms of communications, such as light guns for use in terminal areas, shall be provided in case air-ground voice and data communications fail or are unavailable.

The NAS shall provide techniques for acquiring essential information, including aircraft identification, last known position, and remaining fuel. The system shall provide specialists with the original and amended flight plan data and any other essential information stored in the system upon receipt of their request.

The NAS shall determine the location of an aircraft in an emergency situation.

The system shall be capable of providing specialists at FAA facilities with the azimuth, range, and altitude of an aircraft with respect to a known geographic position if the aircraft is equipped with a functioning transponder.

The determined location shall be accurate (68th percentile) to within 0.23 degrees in azimuth and 103 feet in altitude, and shall be accurate (99th percentile) to within 0.28 nmi for target ranges less than 25 nmi and 2.04 nmi for target ranges greater than 100 nmi.

Specialists shall be provided the capability to determine the location of an aircraft equipped with a functioning VHF transceiver, in selected areas above 2000 feet AGL independent of primary or secondary surveillance capabilities.

When requested, the NAS shall provide the user with distance and magnetic heading information to a suitable aerodrome or navigational aid.

3.2.9 Search and Rescue

3.2.9.1 General Requirements

Early detection and location of overdue and downed aircraft greatly enhances the chance of occupant survival. Many agencies have resources for providing assistance. NAS has the requirement for detecting the need for initiating and assisting in search and rescue activities.

3.2.9.2 Specific Requirements

The NAS shall detect overdue or unreported aircraft.

Appropriate ATC specialists shall be alerted when the difference between the current time and the expected time of arrival (ETA) at the destination terminal exceeds 30 minutes.

AFSS specialists shall be alerted when the difference between the current time and the expected time for re-establishing contact with an aircraft operating over NAS-designated hazardous areas exceeds 15 minutes.

Overdue or unreported aircraft outside the NAS area of coverage but within Flight Information Regions that the NAS has responsibility for shall also be detected.

The NAS shall be capable of initiating search and rescue procedures for overdue or unreported aircraft.

The NAS shall provide assistance in search and rescue operations (such as position information and communications capabilities).

Essential information provided to the specialist concerning the specified aircraft shall include, but not be limited to, the following:

a. Information contained on the original and any amendments to the filed flight plan
b. Last recorded or last known position
c. Last recorded heading
d. Weather conditions in area of last recorded or last known position
e. Weather conditions projected along last reported heading or along predicted flight path

Essential information available within the system data base shall be automatically retrieved and provided to the requesting specialist.

Essential information and other communications shall be exchanged as needed between specialists and any of the following, via dedicated or switched data and/or voice communications channels or via other commercially available means.

a. The appropriate Rescue Coordination Center
b. Any military, federal, state, or local search and rescue facilities or

agencies in the area
c. Any neighboring foreign ATC and/or military ATC facilities or agencies
d. Any pilots airborne in the area

The system shall be capable of processing airspace reservations and flight plans for amendments submitted by search and rescue agencies and aircraft.

The NAS shall monitor transmissions from Emergency Locator Transmitters (ELT).

The ELT frequency shall be monitored throughout the NAS area of responsibility for emergency transmissions on a continuous basis.

The capability to monitor ELT transmissions shall be provided at ATC facilities, such as ATCTs, AFSSs, ACFs.

The capability shall be provided to receive and process reports from non-ATC sources (e.g., pilots, amateur radio operators, and satellites) concerning received ELT transmissions.

The system shall be capable of providing specialists with the geographic coordinates of ELT transmission sites upon detection or upon receiving a report of detection from a non-ATC source.

The NAS shall be capable of providing the specialist, upon request, with a list of aerodromes, terminal areas, and ACFs located within a 100-mile-wide corridor along the projected route from the last known or last reported position to be contacted in the initial inquiry to locate an overdue aircraft.

The NAS shall prepare messages for specialists' review and transmission to other facilities in attempting to locate the aircraft.

Messages containing the following information, as a minimum, shall be prepared for transmission to the facilities selected by the ATC specialist:

a. Type of emergency
b. Aircraft identification
c. Aircraft type and description
d. Destination
e. Aircraft endurance (from flight plan)
f. Last recorded position
g. Last recorded heading
h. Number and identification (if available) of passengers
i. Other remarks deemed pertinent by the specialist

Messages shall be provided to the ATC specialist for review before being

transmitted to the selected addressees.

The NAS shall provide the capability to exchange information with all agencies and facilities concerned with search and rescue activities.

The capability shall be provided for the real-time transmission and receipt of information over cooperatively provided, commercially available communication systems.

The capability shall be provided to input data received from other agencies or facilities with minimal manual processing.

3.2.10 Support of Military Operations

3.2.10.1 General Requirements

The NAS shall be capable of supporting both routine and special military aircraft operations including, but not limited to, the following: reservation of airspace for special use, including both permanently dedicated areas and areas allocated temporarily to support specific military missions; permanently delegated approach control airspace; en route training, refueling, and deployment missions; aircraft surge launch and recovery missions; logistic support and administrative missions; supersonic operations; remotely piloted vehicle operations; artillery missile operations; and other military operations requiring the use of the NAS. The NAS shall be capable of disseminating information regarding military aircraft activity to non-participating civil and military system users. The NAS shall be capable of responding to national defense requirements as specified by Executive Order 11161 and other wartime/contingency directives.

3.2.10.2 Specific Requirements

The NAS shall receive, process, and store airspace reservations from military users.

The NAS shall receive flight plan reservations from the military users, who include:

a. Altitude reservation facilities
b. Military scheduling activities
c. Military base operations
d. Major Air Force, Army, Navy, and Marine Corps commands requiring airspace reservations
e. Military non-ATC facilities such as range control activities, fleet scheduling activities, and air defense facilities

The NAS shall process Special Use Airspace reservations received from military users within 30 minutes of receiving the request.

The NAS shall provide the capability to store, retrieve, and implement various military air traffic control plans associated with national emergencies such as:

a. the Wartime Air Traffic Priority List,
b. Emergency Security Control of Air Traffic Plan,
c. Tactical Air Movement Plan, and
d. Security Control of Air Traffic and Navigation Aids Plan.

The NAS shall be able to store and process a minimum of 1000 low level routes for use by military users.

The NAS shall assist the military mission planner and specialists by providing for the issuance of alternatives concerning routes of flight, altitudes, and departure times to resolve possible airspace conflicts.

The NAS shall provide the capability to receive and process requests from military users for special movement activities of military aircraft within 24 hours of the user's request.

The NAS shall be capable of receiving and responding immediately to requests for airspace reservations [i.e., altitude reservation requests (ALTRV) at emergency order of precedence (class three or above)].

The NAS shall be able to receive classified and unclassified flight plans and route proposals from military scheduling activities, process this information, and advise users and specialists of the most efficient schedule for usage of the airspace.

The NAS shall be capable of receiving, processing, and storing classified flight plans and route proposals with security classifications up to and including secret.

The NAS shall provide the capability to process route proposals based on military requirements such as carrying hazardous cargo, presidential flights, special refueling, and other special interest flights.

The NAS shall provide the communications with military aircraft using specific routes, particularly at the low-altitude designated entry and exit points. The NAS shall be capable of communicating with all military aircraft utilizing designated low-level training routes between the entry/exit altitude of the route and 10,000 feet AGL.

The NAS shall disseminate information concerning the status of Special Use Airspace to users/specialists.

The NAS shall disseminate information on flight activity being conducted in airspace for special use, which includes Restricted Areas, Warning Areas, Military Operating Areas, Controlled Firing Areas, Parachute Jumping Areas, and Military Training Routes.

The NAS shall provide, within 1 minute of receiving the request, information on activities being conducted within airspace for military special use to users desiring to utilize this airspace.

The NAS shall provide this information to commercially available devices such as personal computers via commercial telephone lines.

The NAS shall detect possible non-adherence to separation standards near or in specific Special Use Airspace. The NAS shall provide the surveillance capability to monitor and provide separation services to participating and nonparticipating aircraft inside of and within 5 nmi of military Special Use Airspace and within 500 feet below and 500 feet above such airspace.

Prediction of possible non-adherence to separation standards shall be made from both:

a. Current-clearance-based trajectories
b. Short-term projections based on current position, course, speed, altitude, vertical velocity, and horizontal acceleration.

The NAS shall provide a capability to evaluate alternate-clearance-based trajectories for potential non-adherence to separation standards.

The NAS shall alert the specialists in sufficient time to allow them to take corrective actions to preclude breaches of separation standards. The NAS shall predict a possible breach and alert specialists at least 80 seconds before the breach of separation occurs inside of, within 5 nautical miles of, and within 500 feet below or 500 feet above military Special Use Airspace.

The NAS shall advise the specialists of alternative courses of action to ensure adherence to separation standards.

The NAS shall allow specialists to inhibit the separation assurance functions for those aircraft for which the military has assumed responsibility for separation.

The NAS shall facilitate the continued operation of military air traffic control facilities.

The NAS shall facilitate adequate and timely data exchange between FAA and DoD air traffic control facilities.

The NAS shall facilitate the timely transition of military and civil aircraft to and from airfields served by military air traffic control facilities and the FAA en route/terminal environment.

The NAS shall recognize, utilize, and interface with DoD air traffic control facilities in the provision of common services to both civil and military system users.

3.2.11 Airport Movement Area Control

3.2.11.1 General Requirements

The NAS has responsibility for the control and separation of aircraft and vehicles on the movement areas of qualifying (FAA-designated) aerodromes in

all weather conditions. This shall include separation of aircraft from obstructions.

3.2.11.2 Specific Requirements

The NAS shall provide the capability to determine the identification and location of aircraft and vehicles on airport movement areas at qualifying aerodromes within specified weather conditions.

The NAS shall provide the capability to detect all aircraft and vehicles on movement areas at qualifying aerodromes.

The NAS shall provide surveillance coverage for all movement areas (e.g., runways, landing areas, taxiways, and instrument landing system critical holding areas) and airport master plan approved additions at qualifying aerodromes. This requirement may be satisfied by using multiple sensors presented on a common display.

The NAS shall provide surface detection coverage for 360 degrees of azimuth at surface ranges from 500 feet to 12,000 feet, and for elevation angles of -31 degrees to 0 degrees.

The NAS shall be capable of detecting aircraft and vehicles within the coverage area in conditions of 16 millimeters of precipitation per hour.

The NAS shall detect aircraft and vehicles through a process which does not require cooperating equipment on aircraft or vehicles.

The NAS shall be capable of discriminating between classes of aircraft and vehicles when they are separated by 40 feet in range or 80 feet in azimuth at a range of up to 12,000 feet. Examples of such classes are:

The NAS shall display aircraft/vehicle position within 20 feet of its actual position.

The NAS shall provide the capability, at qualifying aerodromes, to determine if an aircraft has taxied onto or off of an active runway during periods of reduced (100 feet or less) visibility.

The NAS shall provide the capability, at qualifying aerodromes, to determine if an aircraft is in position for takeoff and on the proper runway.

The NAS shall provide means to display position data for aircraft and ground vehicles on airport movement areas under all lighting conditions.

The NAS shall provide the capability to display position data which shall include at a minimum:

a. Location
b. Alphanumeric data

The NAS shall display position data of aircraft and vehicles with a presentation sufficient in contrast and brightness to be clearly visible under all ambient light conditions. The display must be free of reflection and glare.

The NAS shall display aircraft position and related data in relation to appropriate geographic information.

The NAS shall provide the capability of accepting map outline data (e.g., runways, landing areas, taxiways and parking areas) that can be overlaid on position displays.

The NAS shall provide the specialist with the capability to selectively modify the display to present desired information.

The NAS shall provide the capability of defining and displaying runway and taxiway outlines within 12 feet of the actual edge of the runways and taxiways.

The NAS shall provide the specialist with an unobstructed view of the airport movement area.

The NAS shall have the capability to provide airport movement area control on a continuous basis at qualifying airports.

The NAS shall provide specialists with the capability to communicate with aircraft and vehicles in the airport movement area. Alternative forms of communication, such as visual signals transmitted by specialists, shall be provided in case normal air-ground voice and data communications fail or are unavailable.

At qualifying aerodromes, the NAS shall provide automated graphic and text, visual and aural alerts to: potential or actual conflicts of aircraft on the runways, areas adjacent to the runways, and on the close approach paths with other aircraft/vehicles/objects on or near the runways.

3.3 Monitoring

Inflight operations are enhanced by the availability of monitoring services. The NAS is required to provide monitoring services to assist the user in emergency situations, in avoiding other aircraft and in adverse weather. The organization of monitoring requirements is shown in Figure 3-5.

3.3.1 Flight Following

3.3.1.1 General Requirements

The NAS shall be capable of monitoring flights to ensure timely emergency assistance in the event the need develops.

3.3.1.2 Specific Requirements

The NAS shall provide for users to request and accept flight following service.

The NAS shall provide flight following to any user with an active flight plan.

The NAS shall be capable of accepting requests for flight following from airborne aircraft.

The NAS shall obtain such information as identification, position, speed, altitude, and future routing information on aircraft requesting or obtaining flight following.

The NAS shall provide flight following service when requested.

The NAS shall be capable of providing various degrees of flight following service, depending on the following:

a. Type of flight plan filed
b. Aircraft avionics (e.g., communications equipment and transponder)
c. NAS communications and surveillance coverage of the route and altitude flown
d. Degree of pilot participation (e.g., communications contact, position, and ETA updates)

Flight following service shall be available regardless of weather conditions.

The NAS shall be capable of monitoring and updating the progress of aircraft receiving flight following.

The NAS shall be capable of providing flight following service regardless of surveillance coverage of the route being flown.

The NAS shall expand the areas receiving flight following to include selected low-altitude and remote area environments such as off-shore oil platforms, etc.

The NAS shall ensure that hazardous area reporting service is available for users operating in NAS designated Lake, Island, Mountain, and Swamp areas.

The NAS shall alert the specialist when a flight being provided with flight following service is overdue.

The NAS shall use any type of visual and/or aural alert to the specialist.

The alert shall repeat itself regularly until manually deactivated by the specialist.

A flight making airborne position reports shall be considered overdue if out of surveillance coverage and contact has not been re-established within 15 minutes of the expected report time, or as determined by the specialist.

The NAS shall initiate the Search and Rescue process at a preset time (normally 30 minutes) after the estimated time of arrival of an aircraft whose active flight plan has not been closed.

The NAS shall provide the specialist with information on the overdue aircraft, such as aircraft identification and type and time and location of last position.

Initial notification to the specialist shall consist of at least aircraft identification and type, time and location of expected position report, and last known frequency used.

The NAS shall be capable of providing additional information to the specialist on request, such as time and location of last reported or known position and expected future routing.

The NAS shall be capable of providing the specialist with a prioritized list of the facilities to be notified to begin a communications search for the overdue aircraft.

The NAS shall be capable of providing the specialist with any additional historical information known on the overdue aircraft and pilot that may aid in the communications search.

3.3.2 Traffic Advisories

3.3.2.1 General Requirements

The NAS shall be capable of providing traffic advisory services to requesting aircraft.

3.3.2.2 Specific Requirements

The NAS shall be capable of providing traffic advisories to requesting aircraft. The degree of service will depend in part on the following:

1. Type of flight plan filed
2. Aircraft avionics (e.g., communications equipment and transponder) of the requesting aircraft and other aircraft in the vicinity
3. NAS communications and surveillance coverage of the route and altitude flown
4. Degree of participation of pilots of other aircraft in the vicinity

The NAS shall be capable of providing safety advisories and vectoring services to participating aircraft when situations occur involving proximity to the terrain, obstructions, special use airspace, or other aircraft.

The NAS shall use current data on the altitude of terrain and obstructions within the area of NAS responsibility.

The NAS shall alert the specialist to a predicted aircraft impact with terrain or obstructions in sufficient time to permit specialist analysis, communication with the flight crew, crew reaction, and aircrew maneuvering prior to the predicted collision.

Specialists shall alert appropriately equipped and participating aircraft to a NAS-predicted conflict with the terrain, obstructions, aircraft or special use

airspace within 10 seconds of the NAS prediction.

The NAS shall be capable of selecting and displaying to the specialist a recommended avoidance vector for an aircraft with an NAS-predicted conflict. This recommendation should be displayed within 1.2 seconds (99th percentile) of the prediction of a conflict.

The NAS shall be capable of providing sequencing and separation services to VFR aircraft in terminal arrival and departure phases of flight.

The NAS shall be capable of displaying the positions of VFR aircraft in terminal arrival and departure phases of flight.

The NAS shall be capable of applying both IFR and VFR separation services when both types of traffic are operating within terminal areas.

The NAS shall be capable of pointing out other traffic to pilots when applying VFR separation services.

The NAS shall be capable of providing advisory and vectoring services to participating aircraft approaching special use airspace.

The NAS shall monitor the airspace around special use airspace.

The NAS shall be capable of notifying the specialist when known traffic approaches special use airspace.

The NAS shall be capable of selecting and displaying to the specialist a recommended avoidance vector for an aircraft predicted to penetrate special use airspace.

The NAS shall maintain current data on the status and boundaries of special use airspace.

The NAS shall obtain identification, position, speed, altitude, and heading information on aircraft being provided traffic advisory service.

The NAS shall be capable of determining when a potential traffic conflict exists between a requesting VFR aircraft and other aircraft of which the NAS is aware.

3.3.3 Weather Advisories

3.3.3.1 General Requirements

The NAS has a requirement to inform users of hazardous weather conditions and to allow users to request and accept in-flight weather advisories.* The degree of hazard posed by the weather depends upon its intensity, the characteristics of the aircraft, and the phase of flight (take-off, en route, landing). The NAS is required to provide assistance in avoiding hazardous weather upon request by a user.

3.3.3.2 Specific Requirements

The NAS shall be capable of providing weather advisories to aircraft in flight.

The NAS shall be capable of continuous broadcasts of hazardous weather.

The NAS shall provide for direct specialist-to-pilot communications for exchange of weather information.

The NAS shall provide direct user access to weather advisories on a request/reply basis.

Response times for user and specialist access to NAS weather data is provided in 3.1.1.H.1 and 3.1.1.H.3.

Coverage requirements shall be as stated in 3.2.6.C.4.

Weather advisory information shall be continuously available at selected general aviation aerodromes with instrument approach procedures and terminal areas.

The NAS shall be capable of continuously broadcasting the latest approved aerodrome and terminal area conditions on communications media which can be accessed by aircraft in flight and on the ground.

The NAS shall be capable of responding to user and specialist requests for weather information from other NAS facilities, such as an AFSS, ACF, or tower, and from user owned and operated input/output devices, through common carrier communication networks.

Users shall have direct access at all times to current information on hazardous weather conditions along their routes of flight.

The NAS shall broadcast current information on hazardous weather conditions on communications media that can be accessed by appropriately equipped aircraft.

Hazardous weather broadcasts shall be updated at least every 30 minutes and not more than 5 minutes after a significant change of weather.

Dissemination of hazardous weather information shall be given priority over the dissemination of routine weather information.

The hazardous weather information stated in 3.2.6.C.2 shall be available to pilots in flight.

The NAS shall be capable of utilizing automated equipment to disseminate selected weather information directly to appropriately equipped aircraft.

Weather phenomena which pose a hazard to VFR aircraft shall be detected, located, and monitored.

Weather phenomena that may affect VFR flight operations shall be tracked and reported with the same resolution, accuracy, and dissemination as any

other weather conditions which are considered hazardous to flight.

The NAS shall provide advisories on those conditions listed in 3.1.1.B.

The NAS shall be capable of displaying hazardous weather to the specialist.

The NAS shall assist the user in determining an appropriate course of action in avoiding weather or transferring to instrument flight.

The specialist shall, upon user request, suggest new routes, new altitudes, course deviations, or alternate aerodromes.

The NAS shall provide for rapid transition to IFR operation upon request by an appropriately rated and equipped user.

The NAS shall provide reliable communications links between users and specialists for the exchange of information relating to weather avoidance.

The NAS shall be capable of accepting and responding to requests for weather information from airborne aircraft via voice or data link communications.

3.4 Navigation

The NAS shall provide navigation systems that will enable users to safely and efficiently navigate aircraft from take-off to landing within the area of NAS responsibility. The NAS navigational systems shall function under all weather conditions. The organization of navigation requirements is shown in Figure 3-6.

3.4.1 En Route Navigation

3.4.1.1 General Requirements

The NAS shall provide en route navigation systems that enable users to define and use routes of flight and to determine aircraft position.

3.4.1.2 Specific Requirements

The NAS shall provide a primary navigation systems and shall accommodate supplemental navigation systems to meet user requirements.

The NAS shall provide ground based navigational information in such a manner that pilots can determine their position by bearing (q) and range (r) relative to a predetermined aeronautical fix.

The NAS shall provide satellite-based navigational information in such a manner that pilots can determine their position in space by latitude, longitude, and altitude within the designated service volumes of the satellite-based systems.

The NAS shall provide navigational information in such a manner that pilots can determine their position relative to a predetermined flight path.

NAS-provided navigational aids that provide guidance in terms of rho/theta (r/q) coordinates shall be referenced in the following manner: the rho (r)

coordinate shall be referenced to the location of the navigational aids, and the theta (q) coordinate shall be referenced to the magnetic north.

The NAS shall provide en route coverage from 2000 feet above the surface up to and including 60,000 feet above MSL for all NAS designated controlled airspace, unless specifically designated otherwise.

NAS-approved en route navigation systems designated for use in oceanic areas, between the altitudes of FL 275 and FL 400 for normal density traffic, shall support route widths of less than 60 nmi.

NAS-approved en route navigation systems designated for use in domestic areas, between the altitudes of 500 feet above the surface and FL 600 for normal and high-density traffic, shall support route widths of 8 nmi or less.

NAS-approved en route navigational systems designated for use in remote areas, between the altitudes of 500 feet above the surface and FL 600 for normal density traffic, shall support route widths of 20 nmi or less.

NAS-approved en route navigational systems designated for limited-use applications, such as rotorcraft, between the altitudes of 500 feet above the surface and 5000 feet above the surface for low-density traffic (off-shore) shall support route widths of 8 nmi or less.

NAS-approved en route navigational systems designated for limited-use applications, such as rotorcraft, between the altitudes of 500 feet above the surface and 3000 feet above the surface for high-density traffic shall support route widths of 4 nmi or less.

Satellite-based en route navigation systems shall provide integrity such that the probability of presenting hazardously misleading information is less than 1.0x10-7 per hour.

Satellite-based en route navigation systems shall provide a continuity of navigation function of not less than 1 - (10x10-8).

Satellite-based en route navigation systems shall provide a continuity of fault detection function of not less than 1 - (1.0x10-5) per hour.

Satellite-based en route navigation systems shall provide an availability of navigation and integrity monitoring functions of not less than 0.99999.

Satellite-based en route navigation systems shall provide for determination of horizontal position with a 95th percentile horizontal radial position error of 328 feet (100 meters).

En route navigational systems providing guidance in terms of rho/theta (r/q) coordinates should have sufficient capacity to provide bearing information to an unlimited number of aircraft and distance information to at least 100 aircraft per navigational aid simultaneously.

Satellite-based en route navigation systems should have sufficient capacity

to provide for the determination of position-in-space information to an unlimited number of aircraft simultaneously.

There should be no ambiguity of operational significance within navigation systems designated for en route use.

En route navigation systems providing guidance in terms of rho/theta (r/q) coordinates must have a capability of recovering from a temporary loss of signal in such a manner that the signal transmitted to users will provide accurate navigational information without the need for complete resetting.

The NAS shall support the development and certification (NAS and ICAO) of modern systems of aircraft navigation which meet or exceed current standards and are not currently part of the NAS navigation systems.

The NAS navigation systems shall be capable of rapid shutdown or restricted operation in accordance with the military command/FAA supplemental agreements to support national defense requirements.

The NAS shall provide a navigation network that is compatible with NAS-approved user equipment.

En route navigation systems providing guidance in terms of rho/theta (r/q) coordinates shall be referenced to NAS-approved radio navigation aids, the magnetic compass, geographic coordinates, and navigation charts.

En route navigation systems shall have a position update rate and a deviation from-selected-course update rate sufficient to allow coupled autopilot operation.

NAS-provided ground-based en route navigation systems shall, whenever possible, be similar to those provided for terminal areas, so that much of the same airborne equipment can be used for both en route and terminal navigation.

Navigation systems and navigational aids provided by the NAS shall meet or exceed applicable ICAO performance standards.

The NAS shall be capable of providing certain status and location information, such as geographical reference, identification, operating status, bearing information, and distance information for specific ground-based navigational aids.

The NAS shall provide for monitoring of signals from certain designated supplemental navigation systems.

The NAS shall inform specialists and users of the status of supplemental systems and shall provide correction values, if required, to improve navigational accuracy.

The NAS shall discontinue, within 10 seconds, the operation of NAS-provided ground-based navigation systems, or portions thereof, whose

performance is outside of the acceptable parameters.

The NAS shall alert users and specialists, within 10 seconds, of any known failures of navigation systems, or portions thereof, that may affect operations within the NAS airspace.

The location of each NAS-provided rho/theta (p/0) type navigational aid and each navigational fix, reporting point, intersection, waypoint, or other navigational reference point defined relative to rho/theta type type navigational aids, shall be provided in geographic coordinates (latitude/longitude) using an FAA-approved geodetic coordinate reference datum.

Every primary NAS-provided ground-based navigational aid shall transmit an identification that is unique within that navigational aid's area of signal coverage. Transmittal of the identification shall be discontinued whenever the operation of that navigational aid has been discontinued or whenever maintenance or testing on that navigational aid is being done.

3.4.2 Terminal Navigation

3.4.2.1 General Requirements

The NAS shall provide terminal navigation systems that will allow users to navigate to and from aerodromes. Navigation guidance shall be provided in the horizontal and vertical planes, and a means shall be provided to indicate or determine distance information.

3.4.2.2 Specific Requirements

At specified aerodromes, the NAS shall provide navigational capabilities that will give users approach, landing, and departure information such that continuous distance measuring, vertical guidance (glide slope), and azimuth guidance are provided, or can be determined.

The NAS shall provide ground-based terminal navigation information in such a manner that pilots can determine their position by bearing (0) and range (p) relative to a predetermined aeronautical fix.

The NAS shall provide satellite-based terminal navigational information in such a manner that pilots can determine their position in space by latitude, longitude and altitude within the designated service volumes of the satellite-based systems.

The NAS shall provide approach information in such a manner that a pilots can determine their position relative to a predetermined flight path.

NAS-provided navigational aids that provide guidance in terms of rho/theta (r/q) coordinates shall be referenced in the following manner: the rho (r) coordinate shall be referenced to the location of the navigational aids, and the theta (q) coordinate shall be referenced to magnetic north.

NAS-approved terminal navigation systems designated for use between the altitudes of 500 feet above the surface and FL 180 for high-density traffic shall support route widths of 4 nmi or less.

NAS-approved non-precision approach and landing navigation systems designated for use between the altitudes of 250 feet and 3000 feet above the surface for normal density traffic shall support route widths of 2 nmi or less.

The NAS shall provide a means for determining the missed-approach point for non-precision approaches.

The NAS shall provide for non-precision approaches utilizing ground-based navigation guidance systems to be conducted with 0.6 nmi lateral accuracy, of which the NAS equipment shall contribute less than 0.30 nmi error at the missed-approach point.

NAS-approved satellite-based navigation systems designated for terminal area and non-precision approach navigation shall support determination of horizontal position with a 95th percentile horizontal radial position error of not greater than 328 feet (100 meters).

Satellite-based navigation systems designated for use in terminal area and for non-precision approaches shall provide integrity such that the probability of presenting hazardously misleading information is not less than 1.0 x 10-7 per hour.

Satellite-based navigation systems designated for use in terminal area and for non-precision approaches shall provide a continuity of navigation function of not less than 1.0 - (1.0 x 10-8) per hour.

Satellite-based navigation systems designated for use in terminal area and for non-precision approaches shall provide a continuity of fault detection function of not less than 1.0 - (1.0 x 10-8) per hour.

Satellite-based navigation systems designated for use in terminal area and for non-precision approaches shall provide availability of navigation and integrity monitoring functions of not less than 0.99999.

NAS-approved ground-based precision landing systems designated for Category I approaches shall provide guidance between the altitudes of 100 and 3000 feet above the surface, and shall support lateral accuracies of + 30 feet (+ 9.1 meters) and vertical accuracies of + 10 feet (+ 3.0 meters), at 100 feet above the surface.

NAS-approved ground-based precision landing systems designated for Category II approaches shall provide guidance between the altitudes of 50 and 3000 feet above the surface, and shall support lateral accuracies of + 15 feet (+ 4.6 meters) and vertical accuracies of + 4 feet (+ 1.2 meters), at 50 feet above the surface.

NAS-approved ground-based precision landing systems designated for Category III approaches shall provide guidance between the surface and 3000 feet above the surface, and shall support lateral accuracies of + 13.5 feet (+ 4.1 meters) and vertical accuracies of + 1.2 feet (+ 0.4 meters), at 8

feet above the surface.

NAS-approved satellite-based precision landing systems designated for Category I approaches shall provide the requisite accuracy, integrity, continuity, and availability from a designated final approach fix to a point on the approach path 200 feet above the runway threshold, for an approach duration of at least 150 seconds.

NAS-approved satellite-based precision landing systems designated for Category I approaches shall provide for guidance between the altitudes of 100 feet and 3000 feet above the surface and shall support determination of position in space with a 95th percentile horizontal radial position error of 110 feet (33.5) meters) and a 95th percentile vertical error of 32.0 feet (9.75 meters) at 200 feet above the surface.

NAS-approved satellite-based precision landing systems designated for Category I approaches shall provide for determination of position in space along an approach such that the 20. NAS-provided navigation signal contribution to the navigation system error 95th percentile spherical radius is not greater than 20.0 feet (6.20 meters).

NAS-approved satellite-based precision landing systems designated for Category I approaches shall provide integrity such that the probability of presenting hazardously misleading information is less than 1.3x10-7 approach.

NAS-approved satellite-based precision landing systems designated for Category I approaches shall provide continuity of function of not less than 1.0 - (1.0x10-4) per approach.

NAS-approved satellite-based approach systems shall support an approach performance boundary having the dimensions at the specified height above touchdown elevation (HAT) along and relative to the approach path: at 1500 feet HAT, + 1600 feet lateral distance and + 500 feet vertical distance; thence decreasing linearly until: at 300 feet HAT, +470 feet lateral distance and +135 feet vertical distance; thence decreasing linearly until: at 200 feet HAT, +425 feet lateral distance and +110 feet vertical distance.

NAS-approved satellite-based approach systems shall provide guidance in support of precision approaches suchthat the probability of any portion of an aircraft exceeding the defined approach performance boundary is less than 1.0x10-7.

Terminal navigation systems and all precision landing systems shall have a position update rate and a deviation-from-selected-course update rate sufficient to allow coupled autopilot operation.

Precision landing systems shall have the capacity and capability to provide for the indication or determination of course and glide slope information to an unlimited number of aircraft simultaneously.

Designated ground-based terminal navigation and precision landing

systems which provide distance information shall be capable of providing distance information simultaneously to at least 100 aircraft per facility.

The navigational information provided by the terminal systems must be free from unresolved ambiguities of operational significance.

Designated ground-based precision final approach system signal coverage and guidance capability shall be provided in a sector defined as having horizontal coverage of at least + 40 degrees lateral angular width relative to the specified final approach path, having vertical coverage from 0.9 degrees to 15 degrees above the horizontal plane, and extending at least 20 nmi from the landing area.

NAS-provided ground-based terminal navigation systems shall, whenever possible, be similar to those provided for the en route structure, so that much of the same airborne equipment can be used for both terminal and en route navigation.

Terminal and approach navigation systems providing guidance in terms of rho/theta (r/q) coordinates must have a capability for recovering from a temporary loss of signal in such a manner that the signal transmitted to users will provide accurate navigational information without the need for complete resetting.

Terminal navigation systems, aids and approach and landing systems provided by the NAS shall meet or exceed applicable ICAO performance standards.

Navigational capabilities shall be provided to users on a continuous basis under all weather conditions.

The NAS shall provide for monitoring of navigational information for status and operational performance parameters and shall alert users and specialists if there is a change in status that will affect air navigation capabilities (such as changing between functioning as prescribed and not functioning as prescribed or changing between being available for use and not being available for use).

The NAS shall provide for monitoring of signals from designated supplemental navigational systems.

The NAS shall inform specialists and users of the status of supplemental systems and shall provide correction values, if required, to improve navigational accuracy.

The NAS shall discontinue, within 10 seconds, the operation of NAS-provided ground-based navigation systems and navigational aids whose performance is outside of the acceptable parameters.

The NAS shall alert users and specialists, within 10 seconds, to any known failures of navigations systems, or portions thereof, that may affect operations within the NAS airspace.

The location of each NAS provided rho/theta (r/q) type navigational aid, and each navigational fix reporting point, intersection, waypoint, or other navigational reference point defined relative to rho/theta type navigational aids, shall be provided in geographic coordinates (latitude/longitude) using an FAA-approved geodetic coordinate reference datum.

Every primary NAS-provided ground-based navigational aid shall transmit an identification that is unique within that navigational aid's area of signal coverage. Transmittal of the identification shall be discontinued whenever the operation of that navigational aid has been discontinued or whenever maintenance or testing on that navigational aid is being done.

3.4.3 Visual Navigation Aids

3.4.3.1 General Requirements

The number of airports and other landing areas required to support the increasing user demand has made location and identification of the area of intended landing difficult for aircraft not equipped with electronic landing aids. To aid all users during times of reduced visibility or darkness, visual aids to navigation independent of cockpit instrumentation are required. These devices shall include, but are not limited to, lighting, visual descent guidance devices, aerodrome location aids, and standardized aerodrome marking aids.

3.4.3.2 Specific Requirements

The NAS shall provide visual aids that provide for curved, offset, and straight-in guidance as dictated by individual aerodrome/terrain characteristics for precision, nonprecision and visual approaches.

The NAS shall provide approach lighting systems, at qualifying aerodromes, that start at the landing threshold, are aligned with the touchdown area center line, and extend in the approach direction a minimum of 2400 feet for precision instrument runways, a minimum of 0400 feet for non-precision instrument runways, and a minimum of 1000 feet at qualifying helipads with precision approaches.

The NAS shall provide additional approach lighting systems that supplement certain electronic approach aids by providing for curved, offset, high angle, and straight-in visual guidance as dictated by individual aerodrome size, type, service, and terrain characteristics.

The NAS shall provide visual approach lighting systems which will provide guidance to the user in locating and aligning his aircraft with the landing surface. Runway and helipad lighting shall clearly identify the type of landing area being approached.

The NAS shall provide visual aids that provide the user with information on landing area alignment, height perception, roll guidance, and horizontal references.

The NAS shall provide selected aerodromes with approach slope guidance lighting with an effective visual range during clear weather of a minimum 3 miles during daylight hours and 20 miles during night hours.

The NAS shall provide selected aerodromes with approach slope guidance lighting systems that will, at a minimum, identify an appropriate glide slope and incursions outside of acceptable approach slope tolerances.

The NAS shall provide selected aerodromes with runway end identifier lights to provide rapid and positive identification of the approach end of a particular runway. It shall also provide runway edge light systems, touchdown zone lighting, runway center line lighting, runway remaining lighting, and taxiway turn-off lights.

The NAS shall provide at selected aerodromes, helipad landing area perimeter lights, landing direction lights, extended edge and extended wing light bars, and touchdown area lights.

The NAS shall provide visual aids to identify and locate aerodromes.

The NAS shall provide lighting systems to identify the type of aerodrome (e.g., heliport, civil, seaplane), which can be seen for a minimum of 20 nmi at night and 3 nmi during daylight hours.

The NAS shall provide lighting systems to locate and discriminate aerodromes from surrounding features (i.e. city lights, terrain, structures).

The NAS shall ensure proper marking of obstructions in the vicinity of the landing area.

To identify obstructions, the NAS shall require lighting systems which will be visible from a minimum distance of 20 nmi in clear weather during hours of darkness.

The NAS shall provide lighting and markings on those permanent obstructions on the aerodrome surface that could pose a threat to departing, arriving, or taxiing aircraft.

The NAS shall provide a means of visually marking/ identifying taxiways, landing areas, landing area limiting characteristics, and other landing indicators which may be necessitated by specific site requirements.

The NAS shall provide selected aerodromes with lighting systems that provide obstruction clearance within +/- 10 degrees of the extended approach path to a minimum of 4 nmi from the runway threshold. For heliports, obstruction clearance shall be within +/- 10 degrees of the range of approved approaches to a minimum of 0.66 nmi from the touchdown area.

The NAS shall provide the capability for specialists to operate the lighting systems for which it has responsibility.

The NAS shall provide for the operation of aerodrome lighting systems from the control tower.

The NAS shall provide the capability for various light intensity settings for

approach lighting systems which are controlled by specialists.

At selected aerodromes without operating control towers, the NAS shall provide for the operation of aerodrome lighting systems from another designated NAS facility.

The NAS shall provide users with the capability of operating lighting systems where appropriate. The NAS shall provide the capability, at selected aerodromes where lighting is required, for pilots to remotely control aerodrome lighting systems such as approach, runway, and taxiway lights by use of commercially available, airborne equipment.

The NAS shall alert users and specialists to any known failures of visual aids that may affect operations at the landing area.

3.5 Air Defense and Law Enforcement Surveillance

The NAS shall provide for the detection of any aircraft throughout an Air Defense Identification Zone (ADIZ), Distant Early Warning Identification Zone (DEWIZ), and all other airspace for which the NAS has responsibility. The NAS is required to ascertain the position, velocity, and altitude of aircraft in such airspace and to identify unauthorized intruders. The organization of requirements for air defense and law enforcement is illustrated in Figure 3-7.

3.5.1 Aircraft Detection and Identification

3.5.1.1 General Requirements

All aircraft entering an ADIZ or the DEWIZ shall be under surveillance at all times. The NAS shall be required to provide the current and expected location, altitude, speed, and course of each aircraft. National security and law enforcement interests require a method to determine whether the aircraft is authorized or unauthorized. This capability must be available at all times. The NAS must provide a means of communication to support these requirements.

3.5.1.2 Specific Requirements

The NAS shall detect all aircraft entering an ADIZ/DEWIZ.

The NAS shall detect any aircraft entering an ADIZ/ DEWIZ area of surveillance coverage within 13 seconds of penetration.

The NAS shall detect any aircraft entering an ADIZ/DEWIZ to a maximum altitude of 100,000 feet MSL and to a maximum surface range of 250 nmi, from ground level to +30 degrees relative to an earth tangential plane at the sensor site.

The NAS shall provide the position, velocity, and altitude of all aircraft.

The NAS shall detect the position of an aircraft entering an ADIZ/DEWIZ to within a range of 0.125 nmi and azimuth of 0.176 degrees of the aircraft's actual position.

The NAS shall detect the velocity of an aircraft entering an ADIZ/DEWIZ to within 20 knots of the aircraft's actual speed in level-constant-speed flight

and its course accurate to within 5 degrees (99th percentile) of the actual course.

The NAS shall independently detect the altitude of an aircraft entering an ADIZ/DEWIZ within 5000 feet of the aircraft's actual altitude.

The NAS must provide for the identification of aircraft entering an ADIZ/DEWIZ.

The NAS shall associate the flight plan of a known inbound aircraft with a penetrating target within 8 seconds of penetration.

The NAS shall alert specialists within 3.0 seconds maximum when the track of an inbound aircraft cannot be associated with a flight plan.

The NAS shall provide aircraft detection, identification, and related communications capabilities continuously.

The NAS shall provide a capability for the exchange of flight plan data between specialists, military air defense personnel, and law enforcement officials.

The NAS shall provide the capability to exchange data by voice grade and/or automated equipment with military and law enforcement authorities (e.g., NORAD, FBI, DEA, INS).

The NAS shall be capable of providing flight plan data that at a minimum contains:

a. Aircraft call signb. Aircraft type
c. Position
d. Altitude
e. Direction of flight
f. Velocity
g. Remarks

The NAS shall assist military specialists in identifying aircraft entering an ADIZ/DEWIZ.

The NAS shall assist law enforcement authorities in identifying and following aircraft of special interest.

The NAS shall provide the capability to alert specialists within one minute after detection of an aircraft that is operating in NAS airspace using the registration number of a reportedly stolen aircraft.

The NAS shall provide communications between specialists and appropriate military and law enforcement officials.

The NAS shall provide cooperative communications capability between FAA, military specialists, and law enforcement officials.

The NAS shall provide protected communications to alert military and law enforcement officials.

3.6 Communications

The transfer of information between aircraft and the ground (air-ground), between ground facilities (interfacility ground-ground), and within NAS facilities (intrafacility ground-ground) is necessary for safe and efficient operation of the NAS. The information to be transferred includes surveillance, flight plan, flight movement, weather, and monitoring and control information. Both voice and data communications capabilities must be provided. The communications system must be reliable and provide voice privacy as required. The organization of communications requirements is shown in Figure 3-8.

3.6.1 Air-Ground Communications

3.6.1.1 General Requirements

The NAS must be capable of transferring information between aircraft and NAS ground facilities. This capability is required within the NAS area of responsibility. Figure 3-9 illustrates the organization of air-ground communications requirements.

3.6.1.2 Specific Requirements

The NAS shall provide air-ground communications within the operational jurisdictions of NAS.

Air-ground voice and data communications shall be provided within the en route and terminal airspace of the conterminous United States, Alaska, Hawaii, and Puerto Rico.

VHF voice channels in the 117.975 to 136.000 MHz band and UHF voice channels in the 225 to 400 MHz band shall be provided for air-ground voice communications coverage. Generally, VHF and UHF voice channels shall be provided for communications with civil and military users, respectively.

Data channels in the frequency band appropriate for air-ground data communications equipment shall be provided for data communications coverage for both civil and military users.

VHF voice channels in the 136.000 to 137.000 MHz band shall be provided in accordance with forthcoming international agreements.

The following voice communications coverage shall be provided as a minimum:

VHF/UHF voice channels for en route communications between specialists located in area control facilities (ACFs) and automated flight service stations (AFSSs) and users at altitudes at and above 2000 feet AGL (except in areas of low activity) and for lower altitude coverage in areas of special concern (such as military training routes and areas of high rotorcraft activity).

VHF/UHF voice channels for communications from ground level to a minimum altitude of 3000 feet AGL for a minimum radial distance of 5 statute miles, subject to terrain constraints, around control towers serving users at terminal facilities.

VHF voice channels for ground control or clearance delivery communications between specialists at terminal facilities and users and vehicles on the aerodrome surface or controlled movement areas. In addition, UHF voice channels shall be provided at terminal facilities serving both civil and military users for ground control communications.

At least 5 discrete UHF voice channels for single-frequency approach communications from ground level to a minimum altitude of 3000 feet AGL for a minimum radial distance of 5 statute miles, subject to terrain constraints, around control towers serving military users.

Receipt and transmission of emergency voice communications via VHF and UHF at AFSSs while maintaining voice communications via normal assigned VHF and/or UHF channels.

VHF/UHF channels for transmission of pre-recorded and/or computer-generated voice messages at all ACFs, ATCTs, and AFSSs.

VHF/UHF voice channels at selected AFSSs for en route flight advisory service communications between specialists and users.

Clearly intelligible air-ground voice communications shall be provided.

The following data communications coverage shall be provided as a minimum:

Data communications to ground level at qualifying terminal facilities (those meeting Air Traffic Service criteria for air-ground data communications)

Data communications between all other qualified ground locations and aircraft at and above 6000 feet MSL or at and above minimum en route altitude, whichever is higher, up to 60,000 feet MSL

Voice and data communications shall have the following response capabilities:

The ground-air transmission time for data messages shall not exceed 6 seconds.

Initiation of one-way air-to-ground voice transmissions shall not produce delays that adversely impact aeronautical operations or services being provided.

Data communications from specialists in ACFs, ATCTs, and AFSSs to users in appropriately equipped aircraft shall provide the following capabilities as a minimum:

Discrete addressing for transmitting data messages to specific users from specific ATC facilities. Messages shall be deliverable when 32 users are contained in a 10 nmi by 10 nmi area and when 497 users are contained within a 50 nmi by 50 nmi area.

Repetitive transmission of individual data messages such that all suitably equipped users within the coverage area shall receive the same data message.

Single key acknowledgment by addressee of message receipt and content.

Retention and display of sender/addressee identification.

Computer assisted message handling (e.g., formatting, blocking, and reconstruction).

Detection of message format errors.

The NAS shall provide the capability to sustain data exchange with all suitably equipped users.

Air-ground data communications shall be provided with error detection and correction, and signal regeneration capabilities shall be provided as required.

The NAS shall be capable of modular expansion one channel and/or one position at a time for ACF, ATCT, and AFSS air-ground voice and data communications.

Where possible, communications capabilities shall be automated to reduce specialist and user workload.

The NAS shall provide protection against interference from undesired signals on the same or adjacent frequencies.

The NAS shall be able to receive, store, retain, and readily retrieve all NAS air-ground communications.

All air-ground voice and data communications transmitted or received by specialists at FAA facilities shall be recorded at that ATC facility.

Each facility shall have the capability to retain recordings of air-ground voice transmissions for not less than 15 days.

Each facility shall have the capability to retain recordings of air-ground data messages for not less than 30 days.

Individual air-ground voice recordings will be retrievable from "on-line" storage within 30 minutes and from "off-line" storage within 60 minutes of a

request by authorized FAA personnel.

Individual air-ground data messages shall be retrievable from "off-line" storage within 5 minutes of a request by authorized NAS personnel.

A coded time source shall be provided and recorded at selected facilities and shall be interfaced with voice and data recordings to provide time-related data.

The NAS shall provide the capability to monitor any operating position without introducing any change in transmission or reception characteristics.

Each NAS ATC facility shall provide supervisory positions and designated specialist positions with the capability to selectively monitor the content of all air-ground voice and data communications and video displays at each operating position within the facility on an individual basis.

The monitoring initiation, continuation, and breakoff shall not be discernible to the user or specialist in order to prevent distraction of ongoing operations.

The NAS shall provide air-ground communications capabilities on a continuous basis. Each VSCS supported facility shall be provided the capability to access A/G radio control equipment independent of VSCS.

The NAS shall have the capability to reconfigure communications to support changes in operating position responsibilities

The selective reassignment or reconfiguration of air-ground voice and data communications channels to different specialist positions within the same ATC facility shall be performed automatically or shall occur upon receipt of an initiate command from the supervisory position.

The capability shall be provided to develop preset reconfiguration modes to be activated automatically or for a supervisor to initiate command for individual positions and for the entire ATC facility.

Specialists in adjacent ACFs shall have the capability to assume control of the air-ground voice communications and primary responsibility for the air-ground data communications capabilities associated with designated sectors and/or sector regions within 2 minutes of an ACF failure.

The reassignment or reconfiguration of communications capabilities shall not result in the degradation of air-ground voice or data communications.

3.6.2 Ground-Ground Interfacility Communications Connectivity

3.6.2.1 General Requirements

The NAS must be capable of transferring aviation-related information between the various NAS facilities and between NAS facilities and communication systems outside the NAS, both governmental and non-governmental. Figure 3-10 illustrates the organization of interfacility communications.

3.6.2.2 Specific Requirements

The NAS shall provide a communications capability between selected operating, supervisory, maintenance, and administrative positions at separate NAS facilities.

The NAS shall provide direct-access voice communications connectivity between specialists in one ATC facility and designated specialists in another facility as shown in Table 3-1. The number of direct-access calls that are blocked because of saturation of equipment shall not exceed 1 in 1000 calls.

The NAS shall provide capabilities for additional direct-access voice communications connectivity as shown in Table 3-2 for use within 2 minutes of a catastrophic failure in an ACF.

Each facility manager, supervisory and specialist position in an ACF, ATCT, AFSS, the FAA Headquarters Operations Center, and the ATCCC shall be provided the capability for indirect-access voice communications connectivity with other positions in selected facilities as shown in Table 3-3.

Indirect-access calls shall be initiated by activating an indirect-access push button, or equivalent, and entering the number sequence for the position being called (e.g., the sector number or a derivative thereof).

The number of indirect-access calls that are blocked because of saturation of equipment shall not exceed 1 in 1000 calls.

The NAS shall provide the capability for facility managers, supervisors, and/or authorized specialists in FAA-manned facilities to establish voice communications with personnel in any other FAA-manned facility through interface with commercial communications networks. The number of calls that are blocked due to saturation of FAA-owned equipment shall not exceed 1 in 20 calls.

Clearly intelligible interfacility voice communications shall be provided.

The NAS shall provide data communications capabilities between NAS facilities as shown in Table 3-4.

The NAS shall provide a terminal interface at unmanned facilities for use with portable maintenance data terminals.

Each ACF adjacent to a failed ACF shall be provided the following: a. Surveillance data from selected surveillance facilities that normally provide data to the failed ACF with minimal change in the transmission times for surveillance data. b. Data communications with selected ATCTs normally associated with the failed ACF. c. Data communications with selected AFSSs normally associated with the failed ACF. d. Data communications with selected military facilities normally associated with the failed ACF.

The NAS interfacility voice and data communications connectivity shall be provided in a modular fashion such that future increases in capacity shall be

accommodated cost-effectively.

The NAS shall provide a communications capability between selected operating, supervisory, maintenance, and administrative positions at FAA facilities and other public/private communications facilities.

The NAS shall provide the capability for personnel in selected operating, supervisory, maintenance, and administrative positions at FAA facilities to access external public or private telephone networks from their positions.

The NAS shall provide the capability for personnel in selected operating, supervisory, maintenance, and administrative positions at each ATC facility, the ATCCC, and the FAA Headquarters Operations Center to access the DoD Automatic Voice Network (AUTOVON) and any future replacement of that network.

The NAS shall provide the capability to interface with public, private, and other government-owned data communications networks, such as the Automatic Digital Network (AUTODIN), to permit personnel in selected operating and supervisory positions at designated ATC facilities, the ATCCC, and the FAA Headquarters Operations Center to access airline dispatch offices; foreign military and ATC facilities; and DoD air defense facilities, air defense control facilities, ATC facilities, base operations centers, and Strategic Air Command (SAC) centralized scheduling units.

The NAS shall provide voice and data communications interface capabilities with appropriately equipped airline dispatch offices to accommodate air carrier automatic flight plan filing and cancellation capabilities.

The NAS shall provide a data communications interface capability to accommodate the exchange of surveillance information with properly equipped sources external to the NAS to complement the NAS surveillance coverage. Such sources shall include, but not be limited to, joint use surveillance facilities; military radars and surveillance processing facilities, such as Fleet Air Control and Surveillance Facilities (FACSFAC) and Programmable Indicator Data Processor (PIDP) sites; and airline tracking networks, such as the Aeronautical Radio, Inc. (ARINC) network.

The NAS shall provide voice and data communications interface capabilities with appropriate federal and local law enforcement agencies for the exchange of NAS surveillance information.

The NAS shall provide auto-answer capabilities for dial-up data communications by users through interface to commercial telephone lines for filing flight plans and amendments, requesting and receiving terminal and area-specific weather data, and other related purposes. The number of incoming calls blocked because of saturation of FAA-owned equipment shall not exceed 1 in 20 calls.

The quality of voice or data communications provided by the NAS interfacility communications network shall not be diminished by interfacing to public or private networks.

Specialists and supervisors in an AFSS shall be provided the capability to receive incoming commercial telephone calls for providing nonroutine flight services to users.

The NAS shall provide the capability for classified voice and data communications between selected NAS facilities between selected NAS facilities and DoD facilities.

The capability shall be provided to encrypt/decrypt classified information at classification levels up to and including Secret for data transmission between selected NAS facilities and between selected NAS facilities and DoD facilities through data interface to the Defense Communication System (DCS).

Equipment for encrypting data communications or storing classified information shall not be interfaced to computer equipment performing air traffic control functions in NAS facilities.

Physical security facilities shall be provided for the protection of classified material for classification levels up to and including Secret.

The NAS shall provide the capability for secure unclassified voice and data communication. Types of unclassified information requiring security include:

1. National Transportation Safety Board accident investigations
2. Terrorism
3. Hijacking
4. Bomb threats
5. VIP travel
6. Personnel data
7. Certification of aircraft
8. Violations of Federal Aviation Regulations, and
9. Information that is proprietary to Government and industry

3.6.3 Ground-Ground Communications Capabilities

3.6.3.1 General Requirements

The NAS must be capable of transferring information between and within the various NAS facilities. Figure 3-11 shows the organization of these communications requirements.

3.6.3.2 Specific Requirements

The NAS shall provide a means for communication between selected operating, supervisory, maintenance, and administrative positions within or between NAS facilities.

The NAS shall provide direct-access voice communications capabilities between specified positions within ACFs, ATCTs, AFSSs, the ATCCC, and the FAA Headquarters Operations Center.

The NAS shall provide each supervisory and specialist position within ACFs, ATCTs, AFSSs, the ATCCC, and the FAA Headquarters Operations Center with indirect-access voice communications to all other positions within the same facility.

The NAS shall provide the capability for a specialist to force urgent direct-access or indirect-access interfacility and intrafacility calls through to a busy receiver by overriding the existing call.

The capability shall be provided for a specialist or supervisory position at an ATC facility to queue a combination of indirect-access and direct-access interfacility and intrafacility voice transmissions entering the position.

The NAS shall provide the capability for supervisory personnel in an ATC facility to monitor the direct-access and indirect-access interfacility and intrafacility voice transmissions of each specialist within that facility.

The following capabilities shall be provided at each position within an ATC facility (ACF, ATCT, AFSS), the ATCCC, and the FAA Headquarters Operations Center for interfacility and intrafacility voice transmissions:

a. Conference calls with other positions involving any combination of direct-access and indirect-access voice transmissions up to the conference limit. In addition, these may be a combination of interfacility or intrafacility transmissions.
b. Call forwarding for voice transmissions to any other position within that same facility.
c. Call holding for voice transmissions received (except for override calls being forced through the system).
d. Call transfer for voice transmissions (except for override calls being forced through the system) to any other position within that same facility.

The capability shall be provided for supervisors to selectively assign or restrict access to any or all of the special voice communications features (including access to public or private telephone networks) at each specialist's position.

The NAS shall provide an intrafacility data communications capability at each ATC facility, the ATCCC, and the FAA Headquarters Operations Center to provide connectivity between terminals, computers, and peripheral equipment within each facility and between this equipment and the interfacility data network to permit specialist interaction with this equipment as required in performing their functions.

The intrafacility and interfacility data communications capabilities at and between each ATC facility, the ATCCC, and the FAA Headquarters Operations Center shall be capable of supporting the peak busy hour exchange of data including short-term peaks that may occur within the peak hour, with minimal change in the data transmission response times and no loss of data.

The NAS shall provide the capability for supervisory position monitoring of the data flow to or from each specialist position to include, on a noninterference basis, duplicating the specialist's situation display, viewing any data inputs created by the specialist, and viewing any messages displayed to the specialist.

Interfacility and intrafacility data communications shall be provided with error detection and correction capabilities.

Intrafacility voice and data communications shall be capable of modular expansion to meet future communication needs, including increased traffic loads, increased number of operating positions, and new connectivity requirements.

The NAS shall have the capability to reconfigure communication capabilities to support changes in operating responsibilities.

The NAS shall provide reconfiguration capabilities for the distribution of intrafacility and interfacility communications within ATC facilities, as shown in Table 3-5, to accommodate changes in individual position responsibilities, daily combining and decombining of sectors, specialist training, and maintenance actions.

The NAS shall be provided reconfiguration capabilities for distribution of intrafacility and interfacility communications to permit an ACF to provide service in airspace normally served by a failed ACF, as shown in Table 3-5.

The NAS shall provide the capability for the computer assisted and/or supervisory control of the reconfiguration capabilities for intrafacility and interfacility data communications at designated specialist positions within an ACF or an ATCT, as shown in Table 3-5.

The NAS shall be able to receive, store, retain, and readily retrieve NAS interfacility and intrafacility ground-ground communications.

All voice communications entering or leaving each specialist's position at ACFs, ATCTs, AFSSs, the ATCCC, and the FAA Headquarters Operations Center shall be recorded.

All accountable data messages utilized at each specialist's position at each of these facilities shall be recorded. The data recorded shall ensure that all information utilized by the specialist and/or displayed at the specialist's position and all actions or messages initiated by the specialist can be reconstructed.

Voice recordings shall be retained in "off-line" storage for not less than 15 days.

Data recordings shall be retained in "off-line" storage for not less than 15 days.

Individual voice recordings shall be retrievable from "off-line" storage within 30 minutes of a request by an authorized FAA supervisor.

Individual data messages shall be retrievable from "off-line" storage.

A coded time source shall be provided and recorded at selected facilities and shall be interfaced with voice and data recordings to provide time-related data.

The NAS shall provide interfacility and intrafacility ground-ground communications capabilities on a continuous basis.

The NAS shall provide the capability to verify user authorization and limit access to computer operational programs and data bases.

3.6.4 National Emergency Communications

3.6.4.1 General Requirements

In case of a national emergency, the NAS shall be capable of providing communications for national decision makers and military commanders with information on the operational status of the NAS for executive crisis management and control of the national emergency and reconstitution of the NAS. It shall also provide for effective control of the NAS by the National Command Authority (NCA), DOD, and FAA.

3.6.4.2 Specific Requirements

The NAS shall provide the minimum essential emergency communications required to support:

1. Security Control of Air Traffic and Navigation Aids (SCATANA)
2. Civil Reserve Air Fleet (CRAF)
3. War Air Service Program (WASP)
4. Air Carrier Dispersal
5. State and Regional Disaster Airlife (SARDA)
6. Continental U.S. Airborne Reconnaissance for Damage Assessment (CARDA)
7. Special Air Traffic Procedures
8. Military Flight Inspection
9. Monitoring Civil Airlift Operation for DoD

The NAS emergency communications system shall have the following capabilities:

Connectivity. The NAS shall provide emergency communications by means independent of common carrier to rapidly disseminate information from FAA headquarters to regional and sectional facilities and, in turn, rapidly communicate the operational status of those facilities back to headquarters.

Survivability. The NAS emergency communications network shall be protected from nuclear, high-altitude electromagnetic pulse (HEMP).

Endurability. The functions shall be capable of operation for a 30-day period without commercial power at selected critical facilities.

Capabilities.

The Headquarter, NEOF's, RO's and ARTCC's shall be capable of simultaneous voice and data communications with two other locations.

The Headquarters, NEOF's, and other selected locations, shall be capable of off-line data generation, and data storage.

Vulnerability. The NAS emergency communications network shall provide voice and data encryption, if available, to secure all unclassified, sensitive, National Security related communications.

Interoperability. The NAS emergency communications network shall be capable of interoperating with DoD/USAF, NCA, Military command posts (including airborne command post), USCG, FEMA, other Federal agencies, Civil defense, amateur radio, local police, and fire departments.

3.7 Maintenance and Support

Responsive operational service to the users of the National Airspace System requires that FAA personnel and equipment be provided at appropriate locations to meet the current and expected demand. The requirement varies from providing assistance in determining optimum designs and locations of air traffic control facilities to ensuring that the support capabilities provide for continued reliable operation of the system. This requirement includes the necessary testing, training, maintenance, monitoring and flight inspections to ensure safety-of-flight, cost effectiveness, and the required system availability. The organization of requirements for maintenance and support is illustrated in Figure 3-12.

3.7.1 Maintenance and Monitoring

3.7.1.1 General Requirements

Safe operation of the National Airspace System (NAS) depends on the high availability and reliable performance of equipment and software. Ensuring this high level of availability requires timely maintenance and monitoring. Preventive maintenance is required to minimize equipment outages. Corrective maintenance is required to repair faulty items of equipment when detected. Monitoring the performance and status of NAS equipment and software and notifying specialists when problems arise are essential to ensuring safe and reliable operation. Efficiency and cost effectiveness considerations require that monitoring and control capabilities be automatic and remote for selected items, with data and failure indications transmitted to selected facilities for action by appropriate specialists. Equipment critical to safety requires continuous real-time monitoring with the capability for periodic airborne flight inspections for systems involving ground-air and air-ground communications, navigation, and surveillance. An integrated logistics support system is required to ensure that NAS equipments and systems can be maintained and supported in their operational environments as well as being cost-effective over their programmed life-cycles. A design goal for remote facilities shall be for on-site maintenance actions to occur no more frequently than once every 90 days.

3.7.1.2 Specific Requirements

The NAS shall provide a system to monitor all critical parameters; display system status, equipment status and performance; and control appropriate parameters when preventive or corrective maintenance is required. An immediate alarm shall be made to appropriate specialists when one or more selected parameters is out of tolerance, equipment fails, or smoke or fire is detected.

A system shall be provided for specialists at selected facilities to monitor equipment status and performance and to control appropriate parameters, using sensors and built-in circuits, from workstations.

The monitoring system shall have the capability to collect data on equipment maintenance relevant to status and performance.

Monitoring devices, both built-in and external, shall not degrade the performance and user availability of the equipment being monitored.

The network used to control and monitor system performance shall provide positive evidence of its proper functioning.

The monitoring system shall have the capability to interpret sensor information and to indicate degraded performance or expected failure of selected equipments.

Remote control capabilities shall be provided for selected equipments to allow specified adjustment to equipment to keep parameters being monitored within specified ranges, switchover to back-up equipment in the event of equipment failure or performance degradation, and certify equipment performance.

The NAS shall provide continuous monitoring of status and parameters of surveillance, navigation, approach, and landing aids, and other NAS equipment and systems.

The characteristics of the radiated signals from a NAVAID shall provide means for the users to monitor the operational status of the NAVAID.

The monitoring system shall provide notification of any automatic switchovers for equipment and systems that are required for system safety.

The appropriate specialists shall be notified whenever an equipment parameter being monitored or controlled remotely is outside of a pre-specified range.

Monitoring systems shall provide an alarm when the monitored equipment performance levels deteriorate below acceptable limits.

The status of all alarms shall automatically be routed to appropriate control points in the NAS for timely notification of failures to specialists.

The status of all alarms shall be retained and capable of being displayed at control points until the specified condition is restored.

The NAS shall have the capability to perform flight inspections which verify the operation and performance of equipment and systems critical to safety, including electronic and visual navigation aids, approach and landing aids, surveillance, and communications for each initial commissioning, at periodic intervals and after certain maintenance actions. Flight inspections, in special cases, shall be reduced by monitoring and the ability to adjust parameters remotely.

The NAS shall provide facilities, equipment, and systems necessary to perform preventive and corrective maintenance activities including adjustment, diagnosis, replacement, repair, reconditioning, and recertification at scheduled intervals and in response to the monitoring system or general user observations and FAA technical surveillance.

Equipment parameters relevant to maintenance shall be monitored and analyzed to determine preventive maintenance intervals for all NAS equipment.

The capability shall be provided in local and, where appropriate, remote equipment to adjust the equipment for desired performance and to verify that the adjustments are correct.

Preventive maintenance tools to be provided for NAS computer systems shall include on-line diagnostic aids to allow operational software and associated data bases to be exercised through functional paths for isolation of system problems.

The capability shall be provided for the recertification of equipment following maintenance actions to verify the suitability of the equipment for operational use.

Test circuitry and analysis capabilities shall be provided to allow diagnosis of the cause of an equipment/system failure, isolation of the fault, and operational checkout from an on-site, intermediate, or depot repair facility.

The capability shall be provided for on-site maintenance at unmanned facilities to troubleshoot and make repairs, conduct physical inspections, and calibrate the operating equipment and monitoring devices. On site repairs would consist mainly of troubleshooting, removing and replacing Lowest Replaceable Units (LRUs), and checkout. A limited capability to repair systems components which are not LRUs shall be provided on-site.

Intermediate Level Repair Facilities shall be provided with adequate test and working equipment to support repair and maintenance activities determined to be the most effective at those locations.

The FAA Depot Repair Facility shall be provided with the capabilities to troubleshoot, repair, align, overhaul, and checkout equipment or LRUs

which are difficult to repair. These repairs are beyond the capabilities of the Intermediate Level Repair Facilities.

National Field Support Sectors will address system wide problems, develop equipment and software modifications, and provide the highest level of technical assistance on individual facility problems.

Contractor maintenance support shall be used where appropriate to support maintenance activities.

Physical access shall be provided for specialists, test equipment, and replacement LRUs at all NAS facilities.

Common workstation interfaces shall be provided for maintenance and remote monitoring capabilities.

Communication links shall be provided between specialists at NAS facilities and intermediate repair facilities to support maintenance activities.

The NAS shall provide systems for integrated logistics support, maintenance management and logistics inventory management. These systems shall ensure the availability of calibrated test equipment, tools, supply support, and technical data to specialists. They shall provide a national data base of problems and their solutions and preserve maintenance and failure records for history and trend analysis. They shall also support acquisition of parts and materiel, and management, storage distribution and disposal of inventory.

All test equipment and repair parts required for repair of LRUs shall be provided to appropriate specialists. Spare parts shall be provided for on-site, intermediate, and depot maintenance involving replacement of LRUs.

The capability shall be provided to collect, record, process, summarize, and report information concerning equipment performance and related preventive maintenance and repair activities.

Equipment problems or failures, maintenance actions taken, and spares usage shall be recorded and made available for retrieval by specialists.

The capability shall be provided for processing, recording, and correlating parameter measurements to support trend analysis and failure anticipation functions.

Equipment status, performance parameters, and maintenance activity information shall be stored in a nationwide distributed data base with files that are national in scope residing at a central facility. This capability shall provide the specialist with case histories of past problems and their solutions. The database shall be available to authorized specialists.

The logistics inventory system shall assist specialist in obtaining standard parts and materiel; conducting materiel requirements analysis and

provisioning spare parts for new systems; providing quality assurance and shop production control; managing the requisition, receipt, storage, distribution and disposal of parts and materiel; and accessing engineering specifications and related engineering data and service.

3.7.2 Training Support

3.7.2.1 General Requirements

Facilities, equipment, and materials to support an extensive training program are required to effect the implementation of the maintenance philosophy embodied in the NAS; to facilitate the transition to new NAS equipment, computer software, and procedures; and to provide for the progressive improvement and consistent maintenance of the knowledge and skill levels of all NAS personnel.

3.7.2.2 Specific Requirements

The NAS shall provide for a training program, including facilities, equipment, and materials, which prepares specialists for implementation of the maintenance philosophy embodied in the NAS. The NAS shall provide for the training of:

The technical work force to accomplish their primary mission of the monitoring, identification and diagnosis of failures and control of equipment at remote sites

Specialists to accomplish highly specialized maintenance tasks at intermediate and depot repair facilities

Specialists to utilize an automated maintenance management system

The NAS shall provide for a training program, including facilities, equipment, methods, and materials, which prepares specialists for the transition to new NAS equipment, computer software, and procedures.

The NAS shall provide for a training program, including facilities, equipment, methods, and materials, which results in the continuous and progressive improvement in the skill level of specialists.

The NAS shall provide for the training:

a. Identified by the agency as necessary for each position for the achievement of required and optimum efficiency
b. As required to improve individual performance or to prepare the individual for specific potential future responsibilities

The NAS shall provide for a distributed training system with instructional programs allocated among a centralized FAA training facility, local training facilities (e.g., ACFs and AFSSs), and external facilities, as appropriate.

3.7.3 Testing Support

3.7.3.1 General Requirement

A vigorous test and evaluation (T) program is required throughout the entire process of acquiring new and modified equipment and computer software for the NAS. The NAS [i.e., nominally the FAA Technical Center (FAATC) but other locations on a project by project basis] must support determination of the degree to which functional engineering specifications are attained, determination of a system's operational effectiveness and suitability, and verification that the procured items fulfill the requirements and specifications of the procuring contract or agreement. These three processes are referred to as Development Test and Evaluation (DT), Operational Test and Evaluation (OT), and Production Acceptance Test and Evaluation (PAT), respectively.

3.7.3.2 Specific Requirements

The NAS shall provide support for DT in the incremental determination of the degree to which functional engineering specifications are attained.

The NAS shall include specified equipment, test sets, test drivers, scenarios, simulators, data reduction equipment and software, and other test support items required for the conduct of testing.

Specialists shall provide assistance in testing functional integration of units, subsystems, and systems; testing functional integration of hardware with software and operational programs; and testing functional compatibility and integration with operational systems on sites and with the NAS.

Specialists shall participate in the planning of testing, participate in or observe testing, review test data, and evaluate test results to validate integration of an item and its components/elements.

Specialists shall provide operational inputs to planning and conduct of the tests and evaluation of the results of the tests.

The NAS shall provide assistance in studies for the selection of preferred alternative system concepts, identification of preferred technical approaches, development of specifications, and establishment of boundaries for technical and operational parameters.

The NAS shall provide support for OT to validate that operational requirements are met. This shall include determination of a system's operational effectiveness and suitability to be part of the NAS and identification of needed modifications.

Selected end items and components shall be subjected to OT to demonstrate functional integration of hardware components, software elements, hardware and software, and the end item with other equipment. The NAS shall provide:

a. A testbed (nominally the FAATC) consisting of all appropriate NAS equipment, including remote monitoring and control equipment, which can be configured to provide the physical and functional interfaces found at NAS operational sites
b. Simulators, target and message generators, and external interfaces necessary to exercise the item
c. Instrumented aircraft to test the item in the system under known

conditions
d. Data recorders and data reduction equipment and programs necessary for evaluation of the performance of test items
e. Test equipment and spare parts for maintenance of items under test
f. Laboratory facilities to conduct environmental and electromagnetic interference EMI tests

The NAS shall provide support for validation of new or modified equipment or computer software at operational sites to verify integration with the site and with the NAS and to verify its suitability for use in an operational environment.

The NAS shall provide appropriate data recorders, data reduction equipment, and software for the analysis of test results, as necessary.

The NAS shall provide unique installation tools and equipment and unique test equipment required only for initial site certification.

If necessary, the NAS shall provide instrumented aircraft for the conduct of this testing.

The NAS shall be capable of providing the specialists necessary to plan testing, to operate and maintain the item under known conditions, and to evaluate test results.

Specialists shall operate and maintain test items during OT at sites.

The NAS shall provide support for PAT to determine whether serial production items consistently are of the same quality and have the same technical and operational characteristics as items that have been previously tested and accepted and to incorporate specified improvements.

The NAS shall provide equipment, as necessary, for PAT conducted at the developer's/manufacturer's factory to verify contractual compliance of the test item.

NAS specialists shall participate in factory compliance testing, observe testing, participate in testing where required, review test data, and evaluate test results to ensure contractual compliance and to ensure that specified improvements have been incorporated into the item.

3.7.4 Facilities

3.7.4.1 General Requirement

The effective and efficient operation of the NAS is directly related to the adequacy of the facilities provided for FAA personnel, equipment, and furnishings employed in the system. These facilities must be designed and located so as to optimize system cost and system effectiveness, provide suitable working and environmental conditions for NAS personnel, and provide appropriate operating conditions for NAS equipment.

3.7.4.2 Specific Requirements

Individual NAS facilities shall be located and/or consolidated, so as to maximize total system cost effectiveness.

Facilities shall be consolidated wherever possible.

Maintenance sites shall be located to support maximum system availability by providing efficient restoration of service and to provide economical preventive maintenance service.

Repair facilities shall be established and located to facilitate the service and return of repairable items to sites in minimum time and at the lowest possible cost.

Unmanned sites shall be located to achieve maximum effectiveness of installed equipment.

Manned facilities shall be designed in accordance with human engineering practices to provide a safe, secure, reliable, and adequate work environment for assigned personnel and installed equipment.

Access to manned NAS facilities shall be controlled at all times to prevent interruption of service, distraction of specialists, unauthorized access to computers, and theft of government property.

Manned facilities shall comply with all Occupational Safety and Health Administration (OSHA), FAA, and local safety and sanitary regulations.

Dependable and adequate heating/ventilating/air conditioning (HVAC) systems shall be provided at NAS facilities to provide an optimized operating environment for equipment and personnel.

Ambient noise shall be controlled inside manned NAS facilities to foster maximum efficiency of specialists.

Manned NAS facilities shall be constructed to applicable agency and local standards to protect personnel and equipment from the adverse weather conditions and natural disasters which may be expected to occur at a site.

Manned facilities shall be provided with an electrical power system which ensures maximum availability of services.

Adequate space shall be provided in the facility for work environment, personnel, storage, and equipment. Coverage and EMC requirements must be considered.

Unmanned NAS facilities shall be designed to provide a safe, secure, and adequate operating environment for installed equipment and to provide suitable working and environmental conditions for NAS personnel when on-site.

Access to unmanned facilities shall be remotely monitored and controlled to

prevent interruption of service, unauthorized access to computers, theft, and damage to government property.

Selected unmanned NAS facilities shall be constructed to applicable agency and local standards to protect the installed equipment from the adverse weather conditions and natural disasters which may be expected to occur at a site.

Unmanned NAS facilities shall be provided with an electrical power system and systems for remote monitoring and control which ensure maximum availability of services.

Adequate space shall be provided in the facility for work environment, personnel, storage, and equipment. Coverage and EMC requirements must be considered.

3.7.5 Frequency and Spectrum Engineering

3.7.5.1 General Requirement

Present national policy dictates that prior to the procurement of telecommunication systems which involve the use of radio frequencies, the developers shall ensure that adequate radio spectrum is available and that harmful interference from such systems will be neither caused to nor received from other authorized users. This establishes a requirement for frequency and spectrum allocation and management assistance programs.

3.7.5.2 Specific Requirements

The NAS shall develop a formal program to ensure that frequency and spectrum development activities for new systems being conducted by the FAA are compatible with current and projected use by national and international aviation interests.

Frequency allocation proposed for new transmitting and receiving equipment at a site shall be coordinated to ensure electromagnetic compatibility with existing FAA systems present or planned for that site.

Coordination with agencies outside the FAA is required to prevent electromagnetic compatibility problems and resolve out-of-band interference problems with other new or existing national or international systems.

The NAS shall provide frequency and spectrum management assistance to all new and existing programs to ensure that national and international standards are complied with and that no new items of equipment are introduced that would interfere with existing systems.

3.8 System Effectiveness

NAS equipment, systems, installations, and facilities whose functioning is required by the services described in this document must be designed to ensure that they perform these intended functions under any foreseeable operating conditions. The NAS shall meet the user/specialist-related measures of effectiveness described in the following sections. Compliance with these requirements shall be proven by analysis and, where necessary, by appropriate simulation or test. The organization of requirements covering system effectiveness is shown in Figure 3-13.

3.8.1 Operational Readiness

3.8.1.1 General Requirement

NAS equipment, systems, installations and facilities shall be kept in an operable and committable state according to their criticality to safe operation and control of aircraft.

3.8.1.2 Specific Requirements

NAS services to the user/specialist shall be categorized according to the severity of impact of loss of that service on safe separation and control of aircraft. These NAS services as required by this document are categorized in Table 3-6. These categories are:

Critical. Functions or services which, if lost would prevent the NAS from exercising safe separation and control over aircraft.
Essential. Functions or services which, if lost, would reduce the capability of the NAS to exercise safe separation and control over aircraft.
Routine. Functions or services which, if lost, would not significantly degrade the capability of the NAS to exercise safe separation and control over aircraft.

The availability goal for a function or service to the user/specialist is expressed as the ratio of the total time the service is provided to the user/specialist to the maximum available operating time. Service availability shall not be less than that provided by existing capabilities.

Critical Services - .99999
Essential Services - .999
Routine Services - .99

No single failure of equipment, system, installation or facility shall cause loss of service to the user/specialist.

The goal for a single loss of service to a user/specialist shall not exceed the duration shown below:

Critical Services – 6 seconds
Essential Services – 10 minutes
Routine Services – 1.68 hours

The frequency of occurrence goal for any loss of service shall not exceed one per week.

3.8.2 Response Times

Where response times have been specified in the body of the document, the number provided will be identified as a mean, 99th percentile, or maximum value, either explicitly or from the context. Additional specification of response time requirements has been placed in Table 3-7 where such additional detail was

available. The table is keyed to the section and subsection of the document to which the response times apply.

3.8.3 Immediate ACF Backup

3.8.3.1 General Requirement

The NAS is required to provide a capability to take over the control area of an ACF in the event of a catastrophic failure of an individual ACF.

3.8.3.2 Specific Requirements

The immediate ACF backup requirements noted below are for a catastrophic failure. This is considered to be the inability of an ACF to perform its operational responsibilities, regardless of cause, as determined by operational authorities.

The NAS shall provide the capability to reconfigure air-to-ground voice communications to achieve communications with aircraft in backup airspace assigned to positions within the backup facility. (Refer to Para. 3.6.1.F.3 and Para. 3.6.3.B.2.)

The NAS shall provide the capability to reconfigure ground-to-ground voice communications to achieve communications between control positions within the backup facility and control positions in other facilities. (Refer to Para. 3.6.2.A.8 and Para. 3.6.3.B.2.)

The NAS shall provide the capability to supply surveillance data to backup facilities for their respective backup areas. (Refer to Para. 3.6.2.A.8 and Para. 3.6.3.B.2.)

The NAS shall provide each backup ACF with the requisite flight data for assigned backup responsibilities sufficient to allow flight plan association and the creation of flight data displays upon the activation of backup.

The NAS shall provide the capability for facilities to exchange status condition information for backup purposes.

The NAS shall provide a capability for an ACF to continuously notify each of its backup facilities and the ATCCC of its status.

The NAS shall provide a capability for any facility receiving an alert that an ACF has failed to notify all other associated facilities of this alert.

The NAS shall provide a capability for an ACF to notify its backup facilities, associated terminals and ATCCC when it is unable to maintain normal operation.

The NAS shall provide a capability for backup facilities, including the ATCCC, to determine that the failure of an ACF has occurred and to implement the backup capability.

The NAS shall provide the capability for the rapid reassignment of operational and backup sectors to any operating or training position in the facility. (Refer to Para. 3.6.3.B.)

The NAS shall provide the capability to allow air traffic control towers to operate independently of their parent ACF in the event of an ACF failure. These towers which receive surveillance data shall be capable of expanding their display range (within the limits of available processing capacity) beyond that used in normal operation.

The NAS shall provide capabilities to perform the required backup support functions while meeting response time requirements.

The NAS shall provide a capability for failure detection, verification and system notification within ten seconds following an ACF failure.

The NAS shall provide a capability for automatic track initiation and flight plan association in the backup airspace within 60 seconds of an ACF failure.

The NAS shall provide a capability for implementation of the backup operation within two minutes of an ACF failure

The NAS shall provide processing and communications capacities to support the required backup capabilities and to meet the response time requirements specified above, while maintaining safe separation of all aircraft receiving ATC services (i.e., both normal and backup sectors) from the backup facilities.

The NAS shall provide appropriate voice and data communications connectivity between designated military facilities and designated backup ACFs. (Refer to Para. 3.6.2.B.)

3.8.4 Security

3.8.4.1 General Requirements

The NAS shall prevent disclosure to unauthorized persons or processes of information that is either classified in the interest of national security or sensitive because of its operational or administrative nature. Access to information, facilities, and equipment shall be controlled.

3.8.4.2 Specific Requirements

The NAS shall provide physical security to prevent unauthorized access or damage to information, equipment, and facilities.

Physical access to equipment and facilities shall be controlled by appropriate means, such as fencing, guards, or locked doors.

Electromagnetic protection measures shall be provided at facilities where necessary to provide adequate security and protection of NAS systems.

Appropriate containers shall be provided for the storage of classified or sensitive information.

An immediate alarm shall be made to appropriate personnel when an attempt to violate physical security is detected.

The NAS shall provide administrative security in the form of rules and procedures for access to facilities and information.

The NAS shall develop criteria for determination of individuals and classes of personnel who require access or clearances on a need-to-know basis.

The NAS shall provide controls for keys, access codes and passwords for facilities and information.

The NAS shall provide technical security in order to enforce the established rules and procedures.

Logical controls shall be built into information systems to prevent unauthorized persons from gaining access.

Where necessary, cryptography shall be used to deny effective use of information even if access is gained.

3.8.5 Information Systems Security (ISS) Requirements

3.8.5.1 General Requirements

No General Requirement this section

3.8.5.2 Specific Requirements

All NAS systems shall provide the required level of security and necessary training based upon risk analyses and threat and vulnerability assessments.

All NAS systems shall be protected from threats to integrity and availability.

All NAS systems shall provide access control.

All NAS systems shall provide an audit capability sufficient to monitor attempted and successful system intrusions.

All NAS systems shall provide for information system confidentiality based upon the result of a security assessment.

NAS systems shall implement non-repudiation services and authentication procedures at a level based upon a security assessment.

NAS information systems shall protect against malicious code.

All NAS systems shall provide recovery measures from security incidents.

APPENDIX A - UNSATISFIED REQUIREMENTS

This Appendix contains validated requirements, i.e., candidate requirements which have been approved by the Configuration Control Board, but cannot be implemented at this time for technical or economic reasons.

1. INTEGRATION OF LORAN-C INTO THE NAS

- Use of LORAN-C to expand en route navigational signal coverage down to 500 feet AGL and to provide extended coverage offshore

2. DETECTION AND REPORTING OF WIND SHEAR IN TERMINAL AREAS

- Provision of continuous wind shear information, including location, direction of movement, speed, and effect on aircraft performance, for the entire terminal area

3. REDUCTION OF SPACE REQUIREMENTS FOR INDEPENDENT APPROACHES TO PARALLEL RUNWAYS

- Provision for simultaneious approaches by aircraft on adjacent terminal precision approach landing systems where the runway centerlines are spaced at least 3000 feet.

APPENDIX B - BIBLIOGRAPHY

APPENDIX C - GLOSSARY

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ACCESS CONTROL – The process of granting access to information systems resources only to authorized users, programs, processes, or other systems.

ACF SUPPORT METEOROLOGIST - Meteorologist stationed at each ACF with equipment organized for the purpose of detecting, displaying, and disseminating weather information in a timely manner.

ACF BACKUP - The capability to provide alternate control over the airspace of an ACF that has experienced a catastrophic failure. The backup of last resort.

ADDITIONAL SERVICES - Advisory information provided by ATC which includes but is not limited to the following:

1. Traffic Advisories
2. Vectors
3. Altitude deviation information of 300 feet or more from an assigned altitude
4. Advisories that traffic is no longer a factor
5. Weather and chaff information
6. Weather assistance
7. Bird activity information
8. Holding pattern surveillance

Additional services are provided to the extent possible contingent only upon the controller's capability to fit them into the equipment, volume of traffic, frequency

congestion, and controller workload. The controller has complete discretion for determining if he is able to provide or continue to provide a service in a particular case.

ADVANCED AUTOMATION FUNCTIONS - The ACCC shall receive from other ACCCs trial plans, trajectory update information, and messages containing inputs to and/or outputs from advanced automation functions such as Flight Plan Conflict Probe. The messages shall include flight plan conflict and airspace conflict alerts and displays.

ADVISORY - Advice and information provided to assist pilots in the safe conduct of flight and aircraft movement.

AERODROME - A defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure, and movement of aircraft. Aerodromes may include airports, heliports, and other landing areas.

AERODROME LIGHTING - Various lighting aids that may be installed on an aerodrome.

ADJACENT FACILITY - A facility whose assigned airspace borders that of the facility being discussed. This applies to an ACF bordering another ACF and to an ATCT bordering an ACF.

AERONAUTICAL CHART - A map used in air navigation containing all or part of the following:

1. Topographic features
2. Hazards and obstructions
3. Navigation aids
4. Navigation routes
5. Designated airspace
6. Airports

AIRCRAFT - Device/s that are used or intended to be usedfor flight in the air; when used in air traffic control terminology may include the flight crew.

AIRCRAFT IDENTIFICATION - The words, letter(s), and numerals (or combination thereof) which uniquely identify an aircraft, e.g., Air Force 0, NIZ34Y, United 340, T5678.

AIR DEFENSE IDENTIFICATION ZONE/ADIZ - The area of airspace over land or water, extending upward from the surface, within which the ready identification, the location, and the control of aircraft are required in the interest of national security.

AIRMAN'S INFORMATION MANUAL/AIM - A publication containing Basic Flight Information and ATC Procedures designed primarily as a pilot's instructional manual for use in the National Airspace System of the United States

AIR NAVIGATION FACILITY - Any facility used in, available for use in, or designed for use in, aid of air navigation, including landing areas, lights, any apparatus or equipment for disseminating weather information, for signaling, for radio-directional finding, or for radio or other electrical communication, and any other structure or mechanism having a similar purpose for guiding or controlling flight in the air or the landing and take-off of aircraft

AIRPORT - An area on land or water that is used or intended to be used for the landing and takeoff of aircraft, including its buildings and facilities, if any.

AIRPORT ACCEPTANCE RATE - A dynamic input parameter specifying the number of arriving aircraft which an aerodrome can accept from the ACF per hour.

AIRPORT SURFACE DETECTION EQUIPMENT/ASDE - Equipment specifically designed to detect all principal features on the surface of an airport including aircraft and vehicular traffic, and to present the entire image on an indicator in the control tower. Used to augment visual observation by tower personnel of aircraft and/or vehicular movements on runways, landing areas, and taxiways.

AIRPORT TRAFFIC CONTROL SERVICE - A service provided by a control tower for aircraft operating on the movement area and in the vicinity of an aerodrome.

AIR ROUTE TRAFFIC CONTROL CENTER/ARTCC - A facility established to provide air traffic control service to aircraft principally during the en route phase or flight. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft.

AIR TRAFFIC - Aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas.

AIR TRAFFIC CLEARANCE/ATC CLEARANCE - An authorization by air traffic control, for the purpose of preventing collision between known aircraft, for an aircraft to proceed under specified traffic conditions within controlled airspace.

AIR TRAFFIC CONTROL /ATC -

AIR TRAFFIC CONTROL COMMAND CENTER/ACCC - An air traffic service facility consisting of four operational units.

1. Central Flow Control Function/CFCF - Responsible for coordination and approval of all major intercenter flow control restructions on a system basis in order to obtain maximum utilization of the airspace.
2. Central Altitude Reservation Function/CARF - Responsible for coordinating, planning, and approving special user requirements under the Altitude Reservation (ALTRV) concept.
3. Airport Reservation Office/ARO - Responsible for approving IFR flights at designated high-density-traffic airports (John F. Kennedy, LaGuardia, O'Hare, and Washington National)
4. ATC Contingency Command Post - A facility which enables the FAA to manage the ATC system when significant portions of the system's capabilities have been lost or are threatened.

AIR TRAFFIC CONTROL FACILITY - A facility that provides an Air Traffic Control Service.

AIRWAY - A control area or portion thereof established in the form of a corridor, the centerline of which is defined by navigational aids.

ALPHANUMERIC DISPLAY/DATA BLOCK - Letters and numerals used to show identification, altitude, beacon code, and other information concerning a target on a display.

ALTITUDE - The hight of a level, point, or object measured in feet above ground level (AGL) or from mean sea level (MSL).

1. AGL Altitude - Altitude expressed in feet measured above ground level.
2. MSL Altitude - Altitude expressed in feet measured from mean sea level.
3. Indicated Altitude - The altitude as shown by the altimeter. On a pressure or barametric altimeter it is altitude as shown uncorrected for instrument error and uncompensated for variation from standard atmospheric conditions

ALTITUDE READOUT/AUTOMATIC ALTITUDE REPORT - An aircraft's altitude, transmitted via the Mode C transponder feature, that is visually displayed in 100-foot increments.

ALTITUDE RESERVATION/ALTRV - Airspace utilization under prescribed conditions normally employed for the mass movement of aircraft or other special user requirements which cannot otherwise be accomplished. ALTRVs are approved by the appropriate FAA facility.

AMBIGUITY - With respect to navigational systems, two or more possible position fixes having the same set of measurements, with no indication of which is the more nearly correct.

AREA CONTROL FACILITY/ACF - A restructured ARTCC which will perform functions both of an ARTCC and a TRACON.

AREA NAVIGATION/RNAV - A method of navigation that permits aircraft operations on any desired course within the coverage of station-referenced navigation signals or within the limits of self-contained system capability.

1. Area Navigation Low Route - An area navigation route within the airspace extending upward from 1,200 feet above the surface of the earth to, but not including, 18,000 feet MSL.
2. Area Navigation High Route - An area navigation route within the airspace extending upward from and including 18,000 feet MSL to flight level 450.
3. Random Area Navigation Routes/Random RNAV Routes - Direct routes, based on area navigation capability, between waypoints defined in terms of latitude/longitude coordinates, degree/distance fixes, or offset from published or established routes/airways at a specified distance and direction.
4. RNAV Waypoint/W/P - A predetermined geographical position used for route or instrument approach definition or progress reporting purposes that is defined relative to a VORTAC station position or in terms of latitude/longitude

coordinates.

ASSOCIATED FACILITY - A facility having a functional interdependence with an other facility and sharing voice and data communications for the purpose of providing NAS services over a specified area.

ATCCC SPECIALIST - Traffic management specialist resident at the Air Traffic Control Command Center (ATCCC) who coordinates with local traffic management specialists at ARTCCs and manages flow control operations. See ATCCC description.

ATC INSTRUCTIONS - Directives issued by air traffic control for the purpose of requireing a pilot to take specific actions.

AUDIT - A set of processes by which records of information systems security relevant events are kept and maintained by information processing systems. This allows for the periodic or on-demand review of security relevant events such as network communications logs, logon records, and file integrity check events.

AUTHENTICATION - The process of verifying that a claimed identity is correct (i.e., authentic). Authentication is often based on something known or possessed, such as a password or token, where a claimed identity is challenged and shown to be authentic based upon a correct response to the challenge.

AUTOMATED FLIGHT SERVICE STATION/AFSS - A station that will provide interactive alphanumeric and graphic workstations for the flight service specialist.

AUTOMATIC ALTITUDE REPORTING - That function of a transponder which responds to interrogations by transmitting the aircraft's altitude in 100-foot increments.

AUTOMATIC TERMINAL INFORMATION SERVICE/ATIS - The continuouse broadcast of recorded noncontrol information in selected terminal areas. Its purpose is to improve controller effectiveness and to relieve frequency congestion by automating the repetitive transmission of essential but routine information. It normally includes weather and important airport/terminal area information of interest to users.

AVAILABILITY - The property of providing access to a system or a system resource upon demand by an authorized system entity as defined by the performance specifications for the system.

B

BEARING - The horizontal direction to or from any point, usually measured clockwise from true north, magnetic north, or some other reference point, through 360 degrees.

BROADCAST - Transmission of information for which an acknowledgment is not expected.

C

CALL SIGN -

CATASTROPHIC FAILURE - The inability of an ACF to perform its operational responsibilities, regardless of cause, as determined by operaional authorities.

CEILING - The heights above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as "broken", "overcase", or "obscuration", and not classified as "thin" or "partial"

CENTER WEATHER ADVISORY/CWA - An unscheduled weather advisory issued by Center Weather Service Unit meteorologists for ATC use to alert pilots of existing or anticipated adverse weather conditions within the next two hours. A CWA may modify or refine a SIGMET.

CERTIFICATION - A statement of the demonstrated ability of a unit or piece of equpment to perform in accordance with pre-established criteria.

CLASSIFIED INFORMATION - Official information, incluing foreign classified information, which has been designated as requiring protection in the interest of national security.

CLEAR AIR TURBULENCE/CAT - Turbulence encountered in air where no clouds are present. This term is commonly applied to high-level turbulence associated with wind shear. CAT is often encountered in the vicinity of the jet streeam

CODES/TRANSPONDER CODES - The number assigned to a particular multiple pulse reply signal transmitted by a transponder.

CONFIDENTIALITY - Confidentiality is achieved when data is restricted to authorized individuals and automated processes and denied to all others.

CONFLICT - The recognition of the predicated loss of separation minima.

CONFLICT ALERT - A function of certain air traffice control automated systems designed to alert specialists to existing or pending situations recognized by the program parameters that require their immediate attention/action.

COMMERCIALLY AVAILABLE EQUIPMENT - Equipment which is readily available in the marketplace.

CONTERMINOUS U.S. - The forty-eight adjoining states and the District of Columbia.

CONTROLLED AIRSPACE - Airspace designated as a continental control area, control area, control zone, terminal control area, trannsition area, or positive control area within which some of all aircraft may be subject to air traffic control.

TYPES OF U.S. CONTROLLED AIRSPACE:

1. Continental Control Area - The airspace of the 48 contiguous states, the District of Columbia, and Alaska, excluding the Alaska peninsula west of Long. 060° 00' 00" W, at and above 14,500 feet MSL, but does not include:
    a. The airspace less than 0,500 feet above the surface of the earth or,
    b. Prohibited and restricted areas, other than the restricted aseas listed in

FAR Part 70.

2. Control Area - Airspace designated as Colored Federal Airways, VOR Federal Airways, control areas associated with jet routes outside the continental control area (FAR 70.060), additional control areas (FAR 70.063), control area extensions (FAR 70.065), and area low routes. Control areas do not include the continental control area, but unless otherwise designated, they do include the airspace between a segment of a main VOR Federal Airway and its associated alternate segments with the vertical main airway. The vertical extent of the various categories of airspace contained in control areas is defined in FAR Part 70.

3. Control Zone - Controlled airspace which extends upward from the surface and terminates at the base of the continental control area. Control zones that do not underlie the continental control area have no upper limit. A control zone may include one or more airports and is normally a circular area within a radius of five statute miles and any extensions necessary to include instrument approach and departure paths.

4. Terminal Control Area/TCA - Controlled airspace extending upward from the surface or higher to specified altitudes, within which all aircraft are subject to operating rules and pilot and equipment requirements specified in FAR Part 90.

5. Transition Area - Controlled airspace extending upward from 700 feet or more above the surface of the earth when designated in conjunction with an airport for which an approved instrument approach procedure has been prescribed, or from 0,200 feet or more above the surface of the earth when designated in conjunction with airway route structures or segments. Unless otherwise limited, transition areas terminate at the base of the overlying controlled airspace. Transition areas are designated to contain IFR operations in controlled airspace during portions of the terminal operation and while transiting between the terminal and en route environment.

6. Positive Control Area/PCA - Airspace designated in FAR Part 70 within which there is a positive control of aircraft. Flight in PCA is normally conducted under instrument flight rules. PCA is designated throughout most of the conterminous United States and its vertical extent if from 18,000 feet MSL up to and including Flight Level 600. In Alaska PCA does not include the airspace less than 1,500 feet above the surface of the earth, nor the airspace over the Alaska Peninsula west of longitude 160 degrees West.

CONTROLLER - See Specialist

CONVECTIVE SIGMET/WST/CONVECTIVE SIGNIFICANT METEOROLOGICAL - A weather advisory concerning convective weather significant to the safety of all aircraft. Convective SIGMETs are issued for tornadoes, lines of thunderstorms, embedded thunderstorms of any intensity level, areas of thunderstorms greater than or equal to VIP level 4 with an area coverage of 4/00 (40%) or more, and hail 3/4 inch or greater.

COORDINATES - The intersection of lines of reference, usually expressed in degrees/minutes/seconds of latitude and longitude, used to determine position or location.

COORDINATION FIX - The fix in relation to which facilities will handoff, transfer control of an aircraft, or coordinate flight progress data. For terminal facilities, it may also serve as a clearance for arriving aircraft.

COST EFFECTIVENESS - A measure of a system or a piece of equipment that relates mission fulfillment and total life-cycle cost.

COURSE - 1. The intended direction of flight in the horizontal plane measured in degrees from north. 2. The ILS localizer signal pattern usually specified as from course or back course.

D

DEVIATIONS - 1. A departure from a current clearance, such as an off-course maneuver to avoid weather or turbulence. 2. Where specifically authorized in the FARs and requested by the pilot, ATC may permit pilots to deviate from certain regulations.

DIRECT-ACCESS VOICE COMMUNICATIONS - Means whereby a specialist can activate voice communications to a designated position in a different facility with a single action on a single physical device.

DIRECTION FINDER/DF - A radio receiver equipped with a directional sensing antenna used to take bearings on a radio transmitter. Specialized radio direction finders are used in aircraft as air navigation aids. Others are ground-based, primarily to obtain a "fix" is established by the intersection of two or more bearing lines plotted on a navigational chart using either two separately located Direction Finders to obtain a fix on an aircraft or by a pilot plotting the bearing indications of his DF on two separately located ground-based transmitters both of which can be identified on his chart.

DISCRETE FREQUENCY - A separate radio frequency for use in direct pilot-controller communications in air traffic control which reduces frequency congestion by controlling the number of aircraft operating on a particular frequency at one time. Discrete frequencies are normally designated for each control sector in en route/terminal ATC facilities.

DISTANCE MEASURING EQUIPMENT/DME - Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

DISTANT EARLY WARNING IDENTIFICATION ZONE/DEWIZ - An ADIZ over the coastal waters of the State of Alaska.

E

EMERGENCY - A safety condition of being threatened by serious and/or imminent danger which requires immediate or timely assistance.

EMERGENCY LOCATOR TRANSMITTER/ELT - A radio transmitter attached to the aircraft structure which operates from its own power source on 120.5 MHz and 243.0 MHz. It aids in locating downed aircraft by radiating a downward sweeping audio tone, 2-4 times per second. It is designed to function without human action after an accident.

EN ROUTE - One of three phases of flight services (terminal, en route, oceanic). En

route service is provided outside of terminal airspace and is exclusive of oceanic control.

EN ROUTE AIR TRAFFIC CONTROL SERVICES - Air traffic control service provided aircraft on IFR flight plans, generally by ARTCCs, when these aircraft are operating between departure and destination terminal areas. When equipment capabilities and controller workload permit, certain advisory/assistance services may be provided to VFR aircraft.

EN ROUTE FLIGHT ADVISORY SERVICE/FLIGHT WATCH - A service specifically designed to provide, upon pilot request, timely weather information pertinent to the type of flight, intended route of flight, and altitude.

EN ROUTE MINIMUM SAFE ALTITUDE WARNING/E-MSAW - A function of the NAS Stage A en route computer that aids the controller by providing an alert when a tracked aircraft is below or predicted by the computer to go below a predetermined minimum IFR altitude.

F

FAILURE - The event, or inoperable state, in which any item or part of an item does not, or would not, perform as previously specified.

FIX - A geographical position that is determined by visual reference to the surface, by reference to one or more radio NAVAIDs, by celestial plotting, or by another navigational device.

FLIGHT FOLLOWING - The monitoring of the progress of a flight whose navigation is being provided by the pilot. The system will correlate the aircraft position with the proposed flight plan. Flight Following may be accomplished either through procedural methods or surveillance assistance.

FLIGHT INFORMATION REGION/FIR - An airspace of defined dimensions within which Flight Information Service and Alerting Service are provided.

1. Flight Information Service - A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.
2. Alerting Service - A service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid and assist such organizations as required.

FLIGHT LEVEL/FL - A level of constant atmospheric pressure related to a reference datum of 29.92 inches of mercury. Each is stated in three digits that represent hundreds of feet. For example, Flight level 2500 represents a barometric altimeter indication of 25,000 feet; flight level 255, an indication of 25,500 feet.

FLIGHT PATH - A line, course or track along which an aircraft is flying or intended to be flown.

FLIGHT PLAN - Specified information relating to the intended flight of an aircraft that

is filed orally or in writing with an ATC facility.

FLIGHT SERVICE STATION/FSS - Air traffic facilities which provide pilot briefing, en route communications, and VFR search and rescue services; assist lost aircraft and aircraft in emergency situations; relay ATC clearances; originate Notices to Airmen; broadcast aviation weather and NAS information; receive and process IFR flight plans; and monitor NAVAIDS. In addition, at selected locations FSSs provide En route Flight Advisory Service (Flight Watch), take weather observations, issue airport advisories, and advise Customs and Immigration of transborder flights.

FLOW CONTROL - Measures designed to adjust the flow of traffic into a given airspace, along a given route, or bound for a given airport so as to ensure the most effective utilization of the airspace.

G

GEOSTATIONARY OPERATOINAL ENVIRONMENTAL SATELLITE/GOES - A visible and infrared earth sensing satellite. Two satellites exist in geostationary orbits, one covering the eastern U.S. and the other covering the western U.S.

H

HANDOFF - An action taken to transfer the control of an aircraft from one controller to another if the aircraft will enter the receiving controller's airspace and radio communications with the aircraft will be transferred.

HAZARDOUS WEATHER - Weather conditions which have the potential to significantly increase the likelihood of aviation accidents. Hazardous weather conditions include moderate to severe icing, moderate to severe turbulence, moderate to severe precipitation, wind shear, thunderstorms, sustained high winds near the surface, or widespread areas of low visibility.

HELIPORT - An area of land or water, or a structure used or inteded to be used for the landing and takeoff of helicopters, including its buildings and facilities, if any.

HUMAN ENGINEERING - The application of scientific knowledge to the design of items to achieve man-machine integration.

I

IDENT FEATURE - The special feature in the Air Traffic Control Radar Beacon System (ATCRBS) equipment used to immediately distinguish one displayed beacon target from other beacon targets.

IDENTIFICATION - An act or process that presents an identifier to a system so that the system can recognize a system entity and distinguish it from other entities.

IFR AIRCRAFT/IFR FLIGHT - An aircraft conducting flight in accordance with instrument flight rules.

IFR CONDITIONS - Weather conditions below the minimum for flight under visual

flight rules.

INDIRECT-ACCESS VOICE COMMUNICATIONS - Means whereby a specialist can establish voice communications with a designated position through multiple actions on one or more physical devices.

INSTRUMENT FLIGHT RULES/IFR - Rules governing the procedures for conducting instrument flight. Also a term used by pilots and controllers to indicate type of flight plan.

INSTRUMENT LANDING SYSTEM/ILS - A precision instrument approach system which normally consists of the following electronic components and visual aids: 1. Localizer 2. Glide Slope 3. Outer Marker 4. Middle Market 5. Approach Lights

INSTRUMENT METEOROLOGICAL CONDITIONS/IMC - Meteorological conditions expressed in terms of visibility, distance from cloud, and ceilling less than the minima specified for visual meteorological conditions.

INTEGRITY - The quality that exists when data (e.g., computer files and data communications packets) is processed, stored, and/or transmitted in such a way to prevent unauthorized modification, corruption or destruction.

INTERNATIONAL CIVIL AVIATION ORGANIZATION/ICAO - A specialized agency of the United Nations whose objective is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport.

INTERROGATOR - The ground-based surveillance beacon transmitter-receiver, which normally scans in synchronism with a primary radar, transmitting discrete radio signals which repetitiously request all transponders, on the mode being used, to reply. The replies received are mixed with the primary returns and displayed on the same plan position indicator. Also applied to the airborne element of the TACAN/DME system.

INTRUSION - The presence of unauthorized users, traffic, or data in a system.

J

NO GLOSSARY TERMS AT THIS TIME

K

KNOWN TRAFFIC - With respect to ATC clearances, aircraft whose altitude, position, and intentions are known to ATC. With respect to collision avoidance, aircraft whose altitude and position are known to ATC.

L

LANDING AREA - That part of the movement area intended for the landing and takeoff of aircraft.

LIGHT GUN - A handheld directional light signaling device which emits a brilliant

narrow beam of white, green, or red light as selected by the tower controller. The color and type of light transmitted can be used to approve or disapprove anticipated pilot actions where radio communication is not available. The light gun is used for controlling traffic operating in the vicinity of the airport and on the airport movement area.

LONGITUDINAL SEPARATION - The logitudinal spacing of aircraft at the same altitude by a minimum distaince expressed in units of time or miles.

LOST COMMUNICATIONS/TWO-WAY RADIO COMMUNICATIONS FAILURE - Loss of the ability to communicate by radio. Aircraft are sometimes referred to as NORDO (No Radio).

LOW ALTITUDE AIRWAY STRUCTURE/FEDERAL AIRWAYS - The network of airways serving aircraft operations up to but not including 18,000 feet MSL.

LOWEST REPLACEABLE UNIT/LRU - Any level of hardware assembly (e.g., system, segment of a system, subsystem, equipment, component, part) depending on the level of maintenance.

M

MAINTAINABILITY - A characteristic of design and installation that is expressed as the probability that an item will be retained in or restored to a specified condition within a given period of time, when the maintenance is performed in accordance with prescribed procedures and resources.

MAINTENANCE - All actions necessary for retaining an item in, or restoring it to, a specified condition. Types of maintenance are:

1. Corrective - Actions performed, as a result of failure, to restore an item to a specified condition.
2. Preventive - Actions performed in an attempt to retain an item in a specified condition by providing systematic inspection, detection, and prevention of incipient failure.

MALICIOUS CODE - Software or firmware that is intentionally included in a system for an unauthorized purpose, e.g. a Trojan horse.

MANNED FACILITY - A facility which is normally occupied by Specialist, Technicians, or other FAA personel for the conduct or support of NAS operations.

MESOCYCLONE - A vertical column of cyclonically rotating air, typically 2 to 1 km in diameter, within a severe thunderstorm.

METERING - A method of time-regulating arrival traffic flow into a terminal area so as not to exceed a predetermined terminal acceptance rate.

MICROBURST - A downdraft-induced, diverging, horizontal flow near the surface, whose initial dimension is less than 4 km and whose differential velocity is greater

than 10 meters per second.

MILITARY OPERATIONS AREA/MOA - (See Special Use Airspace)

MILITARY TRAINING ROUTES/MTR - Airspace of defined vertical and lateral dimensions established for the conduct of military flight training at airspeeds in excess of 250 knots indicated airspeed.

MINIMUM SAFE ALTITUDE/MSA -

1. The minimum altitude specified in FAR Part 90 for various aircraft operations.
2. Altitudes depicted on approach charts which provide at least 1000 feet of obstacle clearance for emergency use within a specified distance from the navigation facility upon which a procedure is predicated.

These altitudes will be identified as MINIMUM SECTOR ALTITUDES or EMERGENCY SAFE ALTITUDES.

MINIMUMS/MINIMA - Weather condition requirements established for a particular operation or type of operation.

MINIMUM VECTORING ALTITUDE/MVA - The lowest MSL altitude at which an IFR aircraft will be vectored, except as otherwise authorized for approaches, departures, and missed approaches.

MODE - The letter or number assigned to a specific pulse spacing of radio signals transmitted or received by ground interrogator or airborne transponder components of the Air Traffic Control Radar Beacon System (ATCRBS). Mode A (military Mode 3) and Mode C (altitude reporting) are used in air traffic control.

MONITORING - Certain aeronautical advisory services made available by the NAS to airborne aircraft. Service consists of VFR flight following and the providing of various degrees of traffic and weather information to requesting pilots.

MOVEMENT AREA - The runways, taxiways, and other areas of an aerodrome which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports/heliports with a tower, specific approval for entry on the movement area must be obtained from ATC.

N

NAS STAGE A - The en route ATC system's radar, computers and computer programs, controller plan view displays (PVDs/radar scopes), input/output devices, and the related communications equipment which are integrated to form the hear of the automated IFR air traffic control system. This equipment performs Flight Data Processing (FPD) and Radar Data Processing (RDP). It interfaces with automated terminal systems and is used in the cointrol of en route IFR aircraft.

NATIONAL AIRSPACE SYSTEM/NAS - The NAS as used herein describes the FAA facilities, hardware, and software that are a predominant part of the NAS infrastructure and the personnel who operate and maintain that equipment to provide services to the

user.

NATIONAL EMERGENCY - A condition declared by the President or the Congress of the U.S. which authorizes certain emergency actions to be undertaken in the national interest. Actions to be taken may include partial or total mobilization of national resources.

NATIONAL SEARCH AND RESCUE PLAN - An interagency agreement which provides for the effective utilization of all available facilities in all types of search and rescue missions.

NAVAID CLASSES - VOR, VORTAC, and TACAN aids are classed according to their operational use. The three classes of NAVAIDS are:

1. Terminal
2. Low Altitude
3. High Altitude

NAVIGABLE AIRSPACE - Airspace at and above the minimum flight altitudes prescribed in the FARs, including airspace needed for safe takeoff and landing.

NAVIGATIONAL AID/NAVAID - Any visual or electronic device, airborne or on the surface which provides point-to-point guidance information or position data to aircraft in flight.

NON_REPUDIATION SERVICE - A security service that provides protection against false denial of involvement in a communication.

NOTICE TO AIRMEN/NOTAM - A notice containing information (not known sufficiently in advance to publicize by other means) concerning the establishment, condition, or change in any component (facility, service, or procedure of, or hazard in, the National Airspace System) the timely knowledge of which is essential to personnel concerned with flight operations.

NUISANCE ALERT - An unwarranted alert message to a specialist, warning of a present or predicted unsafe situation.

O

OBSTACLE - An existing object, object of natural growth, or terrain at a fixed geographical location, or which may be expected at a fixed location within a prescribed area, with reference to which vertical clearance is or must be provided during flight operation.

OBSTRUCTION - An object/obstacle exceeding the obstruction standards specified by FAR Part 77, Subpart C.

OFF-LINE STORAGE - Storage facilities allowing access to information (voice and/or data) recorded within the past 15 days.

ON-LINE STORAGE - Storage facilities allowing immediate access to informaiton (voice and/or data) recorded within the past 24 hours.

P

PARTICIPATING AIRCRAFT - Aircraft in any of the following categories:

1. Aircraft conducting flight in accordance with instrument flight rules (IFR aircraft)
2. Aircraft conducting flight in accordance with visual flight rules (VFR aircraft) in a Terminal Control Area
3. VFR aircraft operating on a special VFR clearance 4. VFR aircraft with an operating Mode C transponder
5. VFR aircraft communicating with Air Traffic Control

POSITIVE CONTROL - The separation of all air traffic, within designated airspace, by air traffic control.

POSITIVE CONTROL AREA/PCA - (See Controlled Airspace)

PRECIPITATION - Any or all forms of water particles (rain, fog, sleet, hail, or snow) that fall from the atmosphere and reach the surface.

PREDICTED - That which is expected at some future time, postulated on analysis of past experience and tests.

PREFERENTIAL ROUTES - Routes (PDRs, PARs, and PDARs) are adapted in ARTCC computers to accomplish inter/intrafacility controller coordination and to ensure that flight data are posted at the proper control positions. Preferential routes are usually confined to one ARTCCs area and are referred to by the following names or acronyms:

1. Preferential Departure Route/PDR - A specific departure route from an airport or terminal area to an en route point where there is no further need for flow control. It may be included in a Standard Instrument Departure (SID) or a Preferred IFR Route.
2. Preferential Arrival Route/PAR - A specific arrival route from an appropriate en route point to an airport or terminal area. It may be included in a Standard Terminal Arrival (STAR) or a Preferred IFR Route. The abbreviation "PAR" is used primarily within the ARTCC and should not be confused with the abbreviation for Precision Approach Radar.
3. Preferential Departure and Arrival Route/PDAR - A route between two terminals which are within or immediately adjacent to one ARTCC's area. PDARs are not synonymous with Preferred IFR Routes but may be listed as such as they do accomplish essentially the same purpose. (See Preferred IFR Routes, NAS Stage A).

PREFERRED IFR ROUTES - Routes established between busier airposrts to increase system efficiency and capacity. They normally extend through one or more ARTCC areas and are designed to achieve balanced traffic flows among high density

terminals.

PRIMARY FACILITY - The facility normally connected for providing services on a routine basis.

PROHIBITED AREA - (See Special Use Airspace).

PUBLISHED ROUTE - A route for which an IFR altitude has been established and published.

Q

QUOTA FLOW CONTROL/QFLOW - A flow control procedure by which the Central Flow Control Function (CFCF) restricts traffic to the ARTCC area having an impacted airport thereby avoiding sector/area saturation.

R

RELIABILITY - The probability that an item can perform its intended function for a specified interval under stated conditions.

REMOTE AREAS - Sparsely populated area such as mountains, swamps, and large bodies of water.

REMOTE COMMUNICATIONS AIR/GROUND FACILITY/RCAG - An unmanned VHF/UHF trnsmitter/receiver facility which is used to expand ARTCC air-ground communications coverage and to facilitate direct contact between pilots and controllers.

REMOTE COMMUNICATIONS OUTLET/RCO AND REMOTE TRANSMITTER/RECEIVER/RTR - An unmanned communications facility remotely controlled by air traffic personnel. RCOs serve FSSs; RTRs serve terminal ATC facilities. Any RCO or RTR may be UHF or VHF and will extend the communication range of the air traffic facility.

REMOTE CONTROL -

REPORTING POINT - A geographical location in ralation to which the position of an aircraft is reported.

REQUIREMENT - A specified capability which must be provided by the NAS. Types include functional, general, operational, and specific.

1. Functional Requirement - Describes what the system must do to satisfy the operational requirements. A functional requirement must have an action verb and should have well defined inputs and outputs.
2. General Requirement - Relates the characteristics of the operational requirements.
3. Operational Requirement - Qualifies and quantifies the services and products which must be provided to users and specialists. Operational requirements should be directly related to the NAS mission.
4. Specific Requirement - Describes how well a function or service must be

performed and may be either qualitative or quantitative.

RESCUE COORDINATION CENTER/RCC - A search and rescue (SAR) facility equipped and manned to coordinate and control SAR operations in an area designated by the SAR plan. The U.S. Coast Guard and the U.S. Air Force have responsiblility for the operation of RCCs.

RISK ANALYSIS - Risk analysis is a formal process by which system vulnerabilities, threat agents, and mechanisms are identified. In all cases where information systems security functionality and capability is necessary and desired, a risk analysis must be performed. In addition, any time a configuration change is made to the system, a risk analysis must be redone. Risk is a function of the inherent system value, vulnerabilities of the system under consideration, and the existing and potential threats, both human and automated.

ROUTE - A defined path, consisting of one or more courses in horizontal plane, which aircraft traverse over the surface of the earth.

RUNWAY - A defined rectangular area on a land airport prepared for the landing and takeoff run of aircraft along its length. Runways are normally numbered in relation to the magnetic direction rounded off to the nearest 10 degrees, e.g., Runway 10, Runway 25.

S

SAFETY - Freedom from conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property.

SAFETY ADVISORY - A safety advisory issued by ATC to aircraft under their control if ATC is aware the aircraft is at an altitude which, in the controller's judgement, places the airraft in unsafe proximity to terrain, obstructions, or other aircraft.

1. Terrain/Obstruction Advisory - A safety advisory issued by ATC to aircraft under their control if ATC is aware the aircraft is at an altitude which, in the controller's judgment, places the aircraft in unsafe proximity to terrain/obstructions.
2. Aircraft Conflict Advisory - A safety advisory issued by ATC to aircraft under their control if ATC is aware of an aircraft that is not under their control at an altitude which, the controller's judgment, places both aircraft in unsafe proximity to each other.

The issuance of a safety advisory is contingent upon the capability of the controller to have an awareness of an unsafe condition.

SATURATION - The level of air traffic at which no additional traffic may be accommodated.

SEARCH AND RESCUE/SAR - A service which seeks missing aircraft and assists those found to be in need of assistance. It is a cooperative effort using the facilities services available Federal, state, and local agencies.

SECURE/SECURITY -

1. Measures taken to protect the NAS from all acts designed to, or that may, impair its effectiveness.
2. A condition that results from the establishment and maintenance of measures to protect designated information, personnel, equipment, and installations.
3. A condition that prevents unauthorized disclosure of information that is safeguarded as NAS-sensitive (designated operational/administrative) or is classified in the interests of national security.

SECURITY INCIDENTS - Any act or circumstance that intends to harm or actually harms NAS data or information systems, deliberate violation of FAA security policy, or actual or intended violation of U.S. law.

SEPARATION - In air traffic control, the spacing of aircraft to achieve their safe and orderly movement in flight and while landing and taking off.

SEPARATION MINIMA - The minimum longitudinal, lateral, or vertical distances by which aircarft are spaced throught the application of air traffic control procedures.

SEVERE WEATHER AVOIDANCE PLAN/SWAP - An approved plan to minimize the effect of severe weather on traffic flow in impacted terminal and/or ARTCC areas. SWAP is normally implemented to provide the least disruption to the ATC system when flight through portions of airspace is difficult or impossible due to severe weather.

SIGMET/WS/SIGNIFICANT METEOROLOGICAL INFORMATION - A weather advisory issued concerning weather significant to the safety of all aircraft. SIGMET advisories cover severe and extreme turbulence, severe icing, and widespread dust or sand storms that reduce visibility to less than three miles.

SPECIAL USE AIRSPACE - Airspace of defined dimensions identified by an area on the surface of the earth wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities.

TYPE OF SPECIAL USE AIRSPACE:

1. Alert Area - Airspace which may contain a high volume of pilot training activies or an unusual type of serial activity, method of which is hazardous to aircraft. Alert Areas are depicted on aeronautical charts for the information of pilots not involved in the activity for which the Alert Area is established. All activities within an Alert Area are conducted in accordance with Federal Aviation Regulations, and pilots of aircraft involved in the activity as well as pilots transiting the area are equally responsible for collision avoidance.
2. Controlled Firing Area - Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to aircraft not involved in the activity and to ensure the safety of persons and property on the ground.
3. Military Operations Area/MOA - An airspace assignment of defined vertical and lateral dimensions established outside positive control areas to separate/segregate

certain military activities from IFR traffic and to identify for VFR traffic where these activities are conducted.

4. Prohibited Area - Designated airspace within which the flight of aircraft is prohibited.

5. Restricted Area - Aerospace designated under FAR Part 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use, and IFR/VFR operations in the area may be authorized by the controlling ATC facility whenit is not being utilized by the using agency. Retricted areas are depicted on en route charts. Where joint use is authorized, the name of the ATC controlling facility is also shown

6. Warning Area - Area established in international airspace (beyond the three-mile limit) which may contain hazards to aircraft not a part of those activities for which the area is established.

SPECIALIST - The internal individual or group who provides service through the NAS (e.g., controllers, engineers, maintenance, and management personnel)

SPECIAL VFR CLEARANCE - ATC clearance for an aircraft operating under visual flight rules to operate within a control zone in weather conditions less than the basic VFR minima.

SPEED ADJUSTMENT - An ATC procedure used to request pilots to adjust aircraft speed to a specific value for the purpose of providing desired spacing. Pilots are expected to maintain a speed of plus or minus 00 knots or 0.02 mach number of the specified speed.

SURVEILLANCE - The detection, location, and tracking of aircraft within NAS airspace for the purposes of control, separation, and identification. Surveillance systems are electronic in nature; visual methods are purposely excluded. In the case of dependent surveillance, the aircraft provides all flight information. Surveillance systems are differentiated as independent, independent cooperative, and dependent;

1. Independent Surveillance - A system which requires no airborne compatible equipment

2. Independent Cooperative Surveillance - A which requires airborne compatible equipment (e.g., ATCRBS, Mode S)

3. Dependent Surveillance - A system which requires input from navigation equipment aboard the aircraft either via a data link (e.g., LOFF) or via voice transmission (pilot reports).

T

TACTICAL AIR NAVIGATION/TACAN - An ultra-high frequency electronic rho-theta air navigation aid which provides suitably equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TARGET SYMBOL - A computer-generated indication shown on a display resulting

from a primary return or a radar beacon reply.

TERMINAL AREA - A general term used to describe airspace in which approach control service or airport traffic control service is provided.

TERMINAL AREA FACILITY - A facility providing air traffic control service for arriving and departing IFR, VFR, Special VFR, Special IFR aircraft and, on occasoin, en route aircraft.

THREAT ASSESSMENT - The systematic examination of potential sources of harm to an organization and related mechanisms. Threat Assessment is part of the overall risk analysis process.

TOWER/AIRPORT TRAFFIC CONTROL TOWER - A terminal facility that uses air-ground radio communications, visual signaling, and other devics to provide ATC services to aircraft operating in the vicinity of an airport or on the movement area. Authorizes aircraft to land or takeoff at the airport controlled by the tower or to transit the airport traffic area regardless of flight plan or weather contiditons (IFR or VFR). A tower may also provide approach control services.

TRACK - The actual flight path of an aircraft over the surface of the earth.

TRAFFIC -

1. A term used by a specialist to transfer radar identification of an aircraft to another specialist for the purpose of coordinating separation action. Traffic is normally issued (a) in response to a handoff or point out, (b) in anticipation of a handoff or point out, or (c) in conjunction with a request for control of an aircraft.
2. A term used by ATC to refer to one or more aircraft.

TRAFFIC ADVISORIES - Advisories issued to alert pilots to other known or observed air traffic which may be in such proximity to the position or intended route of flight of their aircraft to warrant attention. Such advisories may be based on:

1. Visual observation
2. Observation of radar identified and nonidentified aircraft targets on an ATC radar display
3. Verbal reports from pilots or other facilities

The word "traffic" followed by additional information, if known, is used to provide such advisories; e.g., "Traffic, 2o'clock, one zero miles, southbound, eight thousand".

TRAFFIC MANAGEMENT COORDINATOR - A traffic management specialist resident at the ARTCC traffic management unit (TMU) providing coordination between the national level central flow function of the ATCCC and local ARTCC controllers.

TRAFFIC MANAGEMENT SPECIALIST - Specialist resident at the air traffic control command center (ATCCC) who coordinates between local traffic management specialists at ARTCCs and manages flow control operations. See ATCCC description.

TRAFFIC MANAGEMENT UNIT/TMU - A noncontrol, coordination position at an ARTCC connected to the central flow control function at the ATCCC and responsible for dissemination of flow control information at the local level.

TRAJECTORY - An ordered union of all converted fixes and route segments for a Flight Plan or Trial Plan.

TRANSFER OF CONTROL - That action whereby the responsibility for the separation of an aircraft is transferred from one controller to another.

TRANSFERRING CONTROLLER/FACILITY - A controller/facility transferring control of an aircraft to another controller/facility.

TRIL PLAN - A modified form of an active flight plan that is proposed as a possible replacement for that active flight plan. A Trial Plan shall be processed by route processing and advanced automation functions before entry as an active flight plan or amendment.

U

UNCONTROLLED AIRSPACE - That portion of the airspace that has not been designated as continental control area, contro area, control zone, terminal control area, or transition area and within which ATC has neither the authority nor the responsibility for exercising control over air traffic.

UNICOM - A nongovernment communication facility which may provide airport information at certain airports.

UNMANNED FACILITY - A facility which is normally not occupied by personnel for the conduct or support of NAS operations. Such facilities normally contain equipment which is operated, controlled, and monitored from a manned facility.

UNPUBLISHED ROUTE - A route for which no minimum altitude is published or charted for pilot use. It may include a direct route between NAVAIDS, a radial, a vector, or a final approach course beyond the segments of an instrument approach procedure.

USER - The external individual or group that receive services from the NAS (e.g., Pilot, Air Carrier, General Aviation, Military, Law Enforcement Agencies).

V

VECTOR - A heading issued to an aircraft to provide navigational guidance.

VERTICAL SEPARATION - Separation established by assignment of different altitudes or flight levels.

VFR AIRCRAFT/VFR FLIGHT - An aircraft conducting flight in accordance with visual flight rules or operating on a Special VFR clearance.

VFR CONDITIONS - Weather conditions equal to or better than the minimum for flight under visual flight rules.

VISIBILITY - The ability, as determined by atmospheric conditions and expressed in units of distance, to see and identify prominent unlighted objects by day and prominetn lighted objects by night. Visibility is reported as statute miles, hundreds of feet, or meters.

VISUAL FLIGHT RULES/VFR - Rules that govern the procedures for conducting flight under visual conditions. The term "VFR" is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS/VMC - Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling equal to or better than specified minima.

VISUAL SEPARATION - A means employed by ATC to separate aircraft in terminal areas. There are two ways to effect this separation:

1. The tower specialist sees the aircraft involved and issues instructions, as necessary, to ensure that the aircarft avoid each other.
2. A pilot sees the other aircraft involved and upon instructions from the specialist provides his own separatoin by maneuvering his aircraft as necessary to avoid it

. This may involve following another aircraft or keeping it in sight until it is no longer a factor.

VORTAC/VHR OMNIDIRECTIONAL RANGE/TACTICAL AIR NAVIGATION - A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at one site.

VULNERABILITY ASSESSMENT - The systematic examination of an automated information system or product to determine the adequacy of security measures, identify security deficiencies, provide data from which to predict the effectiveness of proposed security measures, and confirm the adequacy of such measures after implementation. A vulnerability assessment is the process by which system vulnerabilities are identified for specific systems under investigation. Vulnerability assessment is part of the overall risk analysis process.

W

WEATHER ADVISORY/WS/WST/WA/CWA - In aviation forecast practice, an expression of hazardous weather conditions not predicted in the area forecast, as they affect the operation of air traffic and as prepared by the NWS.

WIND SHEAR - A change in wind speed and/or wind direction in a short distance resulting in a fearing or shearing effect. It can exist in a horizontal or vertical direction and occasionally in both.

X

NO GLOSSARY TERMS AT THIS TIME

Y

NO GLOSSARY TERMS AT THIS TIME

Z

NO GLOSSARY TERMS AT THIS TIME

APPENDIX D - ACRONYMS

ACRONYM----------MEANING

A

ACCC----------Area Control Computer Complex

ACF----------Area Control Facility

ADCF----------Air Defense Control Facility

ADIZ----------Air Defense Identification Zone

AERA----------Automated En Route Air Traffic Control

AFCEA----------Armed Forces Communications Electronics Association

AFSS----------Automated Flight Service Station

AFTN----------Aeronautical Fixed Telecommunications Network

AGL----------Above Ground Level

ALTRV----------Altitude Reservation

AMIS----------Aircraft Movement Information Service

ARINC----------Aeronautical Radio Incorporated

ARO----------Airport Reservation Office

ARTCC----------Air Route Traffic Control Center

ASDE----------Airport Surface Detection Equipment

ATC----------Air Traffic Control

ATCCC----------Air Traffic Control Command Center

ATCRBS----------Air Traffic Control Radar Beacon System

ATCT----------Air Traffic Control Tower

ATIS----------Automated Terminal Information Service

AUTODIN----------Automated Digital Network

AUTOVON----------Automated Voice Network

B

C

CARF----------Central Altitude Reservation Function

CFCF----------Central Flow Control Function

CFR----------Code of Federal Regulations

CRT----------Cathode-Ray Tube

CWA----------Center Weather Advisory

D

DARC----------Direct Access Radar Channel

dB----------Decibel

DCS----------Data Communications Subsystem

DDD----------Direct Distance Dialing

DEA----------Drug Enforcement Agency

DEWIZ----------Distant Early Warning Identification Zone

DF----------Direction Finder

DME----------Distance Measuring Equipment

DoD----------Department of Defense

DOT----------Department of Transportation

DT----------Development Test and Evaluation

E

EFAS----------En route Flight Advisory Service

ELT----------Emergency Locator Transmitter

EMC----------Electromagnetic Compatibility

EMI----------Electromagnetic Interference

EMSAW En Route Minimum Safe Altitude Warning

F

FAA Federal Aviation Administration

FAATC Federal Aviation Administration Technical Center

FACSFAC Fleet Area Control and Surveillance Facility

FAF Final Approach Fix

FAR Federal Aviation Regulation

FBI Federal Bureau of Investigaiton

FL Flight Level

FSAS Flight Service Automation System

FSDPS Flight Service Data Processing System

FSS Flight Service Station

FTS Federal Telecommunications System

G

GOES Geostationary Operational Environment Satellite

GPS Global Positioning System

H

HIWAS Hazardous Inflight Weather Advisory Service

HVAC Heating, Ventilation, and Air Conditioning

I

ICAO International Civil Aviation Organization

IFR Instrument Flight Rules

ILS Instrument Landing System

INS Immigration and Naturalization Service

J

K

kHz Kilohertz

km Kilometer

L

LOFF Loran C Flight Following

LORAN-C Long Range Navigation

LRU Lowest Replaceable Unit

M

MHz Megahertz

MLS Microwave Landing System

MOA Military Operation Area

MPSG Maintenance Philosophy Steering Group

MSA Minimum Safe Altitude

MSL Mean Sea Level

MVA Minimum Vectoring Altitude

N

NADIN National Airspace Data Interchange Network

NAS National Airspace System

NASP National Airspace System Plan

NAVAID Navigational Aid

NAWPF National Aviation Weather Processing Facility

NEXRAD Next Generation Weather Radar

nmi Nautical Miles

NORAD North American Air Defense Command

NORDO No Radio

NOTAM Notice to Airmen

NTIA National Telecommunications and Information Administration

NWS National Weather Service

O

ODAPS Oceanic Display and Planning System

OPS Operations

ORD Operational Readiness Demonstration

OSHA Occupational Safety and Health Administration

OT Operational Test and Evaluation

P

PAR Preferential Arrival Route

PAT Production Acceptance Test and Evaluation

PCA Positive Controlled Airspace

PDAR Preferential Departure and Arrival Route

PDR Preferential Departure Route

PIDP Programmable Indicate Data Processor

PIREP Pilot Report

PVD Plan View Display

Q

QFLOW Quota Flow Control

R

RAPCON Radar Approach Control

RCAG Remote Communications Air-Ground

RCC Rescue Coordination Center

RCE Radio Control Equipment

RCO Remote Communications Outlet

RDP Radar Data Processor

RIS Reports Identification Symbol

RMMS Remote Maintenance Monitoring System

RNAV Area Navigation

RTR Remote Transmitter/Receiver Sites

RVR Runway Visual Range

S

SAR Search and Rescue

SID Standard Instrument Departure

SIGMET Significant Meteorological Condition

T

TACAN Tactical Aircarft Control and Navigation

TCA Terminal Control Areas

TMU Traffic Management Unit

TRACON Terminal Radar Approach Control Facility

T Test and Evaluation

U

UHF Ultra High Frequency

UNICOM Frequencies Used for Aeronautical Advisory Services to Private Aircraft

V

VFR Visual Flight Rules

VHF Very High Frequency

VMC Visual Meteorological Conditions

VOR Very High Frequency Omnidirectional Radio

VORTAC Collocated VOR and TACAN

VSCS Voice Switching and Control System

W

WA Winds Aloft Forecast

WS Weather Service

WST Convective SIGMET

X

Y

Z

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    /help/cats_help.cfm) ] from
  D:\web_nas5\common\cfw\page_element.cfc</TD></TR>
<TR>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=middle>1</TD>
  <TD class=cfdebug noWrap align=left>CFC[
    D:\web_nas5\common\data_element\requirement\common.cfc |
    getApplication(root_path) ] from
    D:\web_nas5\common\data_element\requirement\base_data_object.cfc<,
<TR>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=middle>1</TD>
  <TD class=cfdebug noWrap align=left>CFC[
    D:\web_nas5\common\data_element\requirement\common.cfc |
    getSession(Schema, cats2_schema0) ] from
    D:\web_nas5\common\data_element\requirement\base_data_object.cfc<,
<TR>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=middle>1</TD>
  <TD class=cfdebug noWrap
    align=left>D:\web_nas5\webroot\Application.cfm</TD></TR>
<TR>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=middle>1</TD>
  <TD class=cfdebug noWrap
    align=left>D:\web_nas5\webroot\OnRequestEnd.cfm</TD></TR>
<TR>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=middle>1</TD>
  <TD class=cfdebug noWrap
    align=left>D:\web_nas5\webroot\settings\global_settings.cfm</TD><,
<TR>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=right>0 ms</TD>
  <TD class=cfdebug noWrap align=middle>1</TD>
  <TD class=cfdebug noWrap
    align=left>D:\web_nas5\webroot\settings\server_settings.cfm</TD><,
<TR>
  <TD class=cfdebug noWrap align=right><I>0 ms</I></TD>
  <TD colSpan=2> </TD>
  <TD class=cfdebug align=left><I>STARTUP, PARSING, COMPILING,
    LOADING, &amp; SHUTDOWN</I></TD></TR>
<TR>
```

```
        <TD class=cfdebug noWrap align=right><I>1359 ms</I></TD>
        <TD colSpan=2> </TD>
        <TD class=cfdebug align=left><I>TOTAL EXECUTION
      TIME</I></TD></TR></TBODY></TABLE><FONT color=red><SPAN
    class=template_overage>red = over 250 ms average execution
    time</SPAN></FONT> </A>
    <P class=cfdebug>
    <HR>
    <B class=cfdebuglge><A name=cfdebug_exceptions>Exceptions</A></B>
    <P></P>
    <DIV class=cfdebug>04:32:00.000 - Expression Exception - in
    D:\web_nas5\common\cfw\page_master.cfc : line 438</DIV><PRE>      The e
        </PRE>
    <P class=cfdebug>
    <HR>
    <B class=cfdebuglge><A name=cfdebug_sql>SQL Queries</A></B>
    <P></P><CODE><B>messageQuery</B> (Datasource=baseline, Time=63ms,
    Records=0) in D:\web_nas5\webroot\requirements\view_sr1000.cfm @
    04:32:00.000</CODE><BR><PRE>SELECT PM.message_id, PM.message_text, PM.m
            PM.post_date, PM.posting_user_id, LU.first_name ||' '||LU.last_
      FROM cats2_control.page_message PM,
            cats2_control.login_user LU
     WHERE (    affected_page =? )
       AND PM.posting_user_id =LU.user_id
       AND post_date &lt;= SYSDATE
       AND expiration_date &gt;= SYSDATE
</PRE><CODE>Query Parameter Value(s) -<BR>Parameter #1(cf_sql_varchar) =
    requirements/view_sr1000.cfm<BR></CODE><BR><CODE><B>qryReqs</B>
    (Datasource=baseline, Time=890ms, Records=1476) in
    D:\web_nas5\webroot\requirements\view_sr1000.cfm @ 04:32:01.001</CODE><B
              REQ_ID, PARENT_ID, DOORS_REQ_ID, CHILD_COUNT, DESCRIPTION,
              (SELECT COUNT(SVHID) FROM CATS2_SCHEMA0.REQ_SR1000_MAPPING WH
        FROM CATS2_SCHEMA0.REQ_SR1000_REQUIREMENT R

        ORDER BY SORT
</PRE><CODE><B>lastUpdate</B> (Datasource=baseline, Time=0ms, Records=1)
    in D:\web_nas5\common\cfw\page_master.cfc @ 04:32:01.001</CODE><BR><PRE>
                    FROM cats2_schema0.log_touch_table
              </PRE><CODE><B>recordhit</B> (Datasource=baseline, Time=0ms,
    in D:\web_nas5\webroot\OnRequestEnd.cfm @ 04:32:01.001</CODE><BR><PRE>
                INTO CATS2_LOG0.track_hits (
                          hitstamp,
                          path_info,  query_string, http_referer,
                          userid, proctime)
               values (sysdate,
                          ?,
                          ?,
                          ?,
                          ?,
                          ?)
```

```
            </PRE><CODE>Query Parameter Value(s) -<BR>Parameter #1(cf_sql_varc
      /nas5/requirements/view_sr1000.cfm<BR>Parameter #2(cf_sql_varchar) =
      REQ_ID=-1&amp;ShowServices=N&amp;CFWH=1<BR>Parameter #3(cf_sql_varchar)
      <BR>Parameter #4(cf_sql_varchar) = <BR>Parameter #5(cf_sql_float) =
      1.359<BR></CODE><BR>
      <P class=cfdebug>
      <HR>
      <B class=cfdebuglge><A name=cfdebug_scopevars>Scope Variables</A></B>
      <P></P><PRE><B>CGI Variables:</B>
AUTH_PASSWORD=
AUTH_TYPE=
AUTH_USER=
CERT_COOKIE=
CERT_FLAGS=
CERT_ISSUER=
CERT_KEYSIZE=
CERT_SECRETKEYSIZE=
CERT_SERIALNUMBER=
CERT_SERVER_ISSUER=
CERT_SERVER_SUBJECT=
CERT_SUBJECT=
CF_TEMPLATE_PATH=D:\web_nas5\webroot\requirements\view_sr1000.cfm
CONTENT_LENGTH=0
CONTENT_TYPE=
CONTEXT_PATH=
GATEWAY_INTERFACE=CGI/1.1
HTTPS=off
HTTPS_KEYSIZE=
HTTPS_SECRETKEYSIZE=
HTTPS_SERVER_ISSUER=
HTTPS_SERVER_SUBJECT=
HTTP_ACCEPT=*/*
HTTP_ACCEPT_ENCODING=gzip, deflate
HTTP_ACCEPT_LANGUAGE=en-us
HTTP_CONNECTION=Keep-Alive
HTTP_COOKIE=
HTTP_HOST=127.0.0.1
HTTP_REFERER=
HTTP_USER_AGENT=Mozilla/4.0 (compatible; MSIE 6.0; Windows NT 5.0; .NET CLR 1
PATH_INFO=/nas5/requirements/view_sr1000.cfm
PATH_TRANSLATED=D:\web_nas5\webroot\requirements\view_sr1000.cfm
QUERY_STRING=REQ_ID=-1&amp;ShowServices=N&amp;CFWH=1
REMOTE_ADDR=127.0.0.1
REMOTE_HOST=127.0.0.1
REMOTE_USER=
REQUEST_METHOD=GET
SCRIPT_NAME=/nas5/requirements/view_sr1000.cfm
SERVER_NAME=127.0.0.1
SERVER_PORT=80
SERVER_PORT_SECURE=0
```

SERVER_PROTOCOL=HTTP/1.1
SERVER_SOFTWARE=Microsoft-IIS/5.0
WEB_SERVER_API=
</PRE><PRE><B>Client Variables:</B>
cfid=678091
cftoken=47898364
hitcount=1
lastvisit={ts '2005-11-02 04:32:00'}
timecreated={ts '2005-11-02 04:32:00'}
urltoken=CFID=678091&CFTOKEN=47898364
</PRE><PRE><B>Cookie Variables:</B>
CFAUTHORIZATION_CATSII=
CFID=678091
CFTOKEN=47898364
</PRE><PRE><B>Session Variables:</B>
cfid=678091
cftoken=47898364
defaulthelppage=/help/cats_help.cfm
navbar_menu=VIEWS
navbar_submenu=
schema=cats2_schema0
sessionid=CATSII_678091_47898364
urltoken=CFID=678091&CFTOKEN=47898364
</PRE><PRE><B>URL Parameters:</B>
CFWH=1
REQ_ID=-1
SHOWSERVICES=N
</PRE><FONT class=cfdebug size=-1><I>Debug Rendering Time: 78
ms</I></FONT>
</TD></TR></TBODY></TABLE></BODY></HTML>